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Design, Construction, Operation of Metal-Working Equipment and Manufacture of Metal Products

MACHINERY

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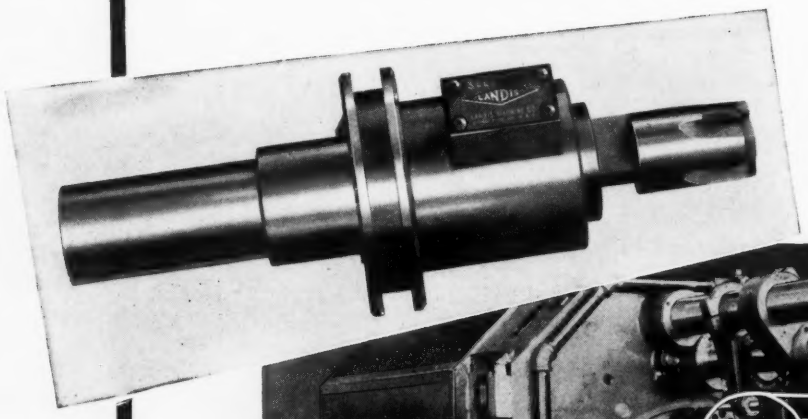

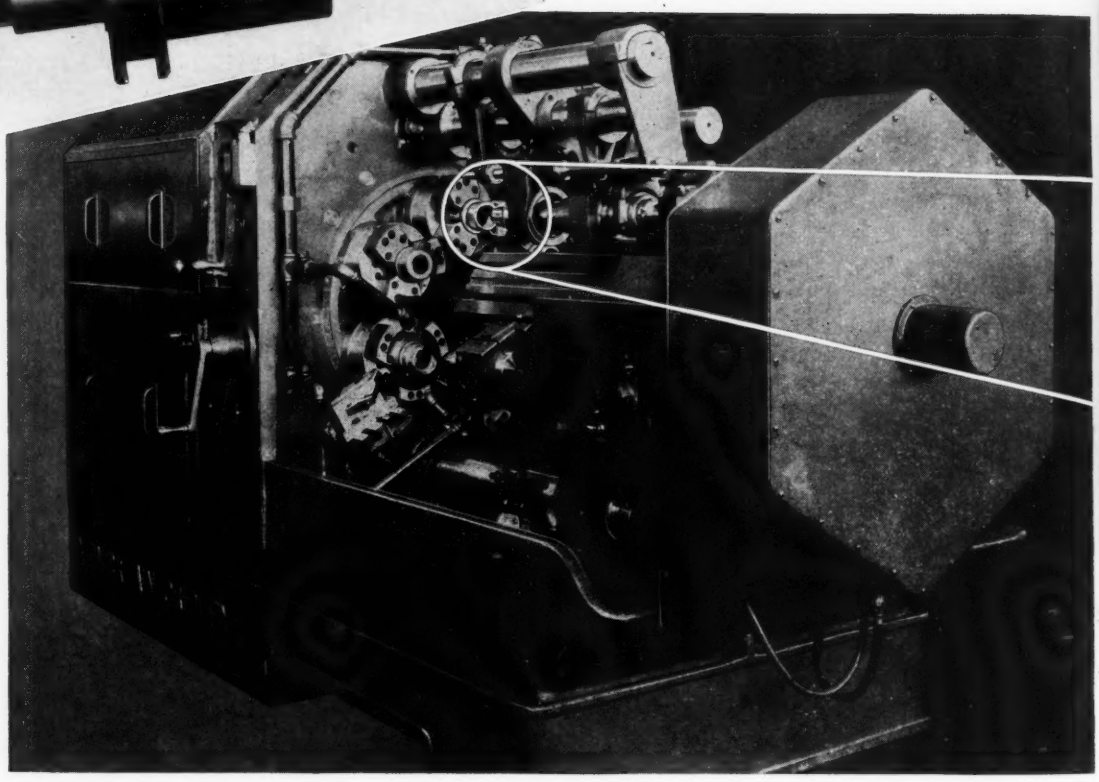

● The LL Taps are designed primarily for tapping tapered threads to A. P. I. standards. An outstanding feature is the detachable tap head permitting the use of various size tap heads to cover a wide range of thread sizes with a minimum amount of equipment.

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THE WORLD'S LARGEST MANUFACTURER OF

MACHINERY
AUGUST, 1948
Volume 54 Number 12

High-Speed Planing with Carbide Tools

Carbide Tools of Improved Design Permit Planing of Semi-Steel Castings at Speeds up to 300 Feet per Minute with Feeds of from 3/64 to 1/8 Inch and Depths of Cut up to 1 Inch

By W. P. COOMEY
General Superintendent
Rice Barton Corporation
Worcester, Mass.

WHEN carbide tools are employed, the planing of cast iron, mild steel, or semi-steel castings is usually done at speeds somewhat less than 200 surface feet per minute. Those plants that plane at higher speeds generally restrict the depth of cut and feed, taking only a very light cut. With high-speed steel tools—even when they are made of the best type of cobalt high-speed steel—the operating speeds seldom are in excess of 100 surface feet per minute.

At the plant of the Rice Barton Corporation, semi-steel castings (35 to 40 per cent steel) are being planed at speeds from 240 to 310 surface feet per minute. The depth of cut varies from 1/4 to 1 inch, and the feed from 0.045 to 0.125 inch. Mild steel parts for paper mill and textile machinery are planed at the same speeds, with a maximum depth of cut of 1/2 inch and a feed of approximately 0.030 inch.

Semi-steel castings (ranging in hardness from 260 to 280 Brinell) are difficult to machine

under ordinary conditions, and in this case, the shock on the tool is even greater, due to the fact that many of the parts have irregular contours or interrupted surfaces. However, despite these severe operating conditions, no carbide-tipped planing tool has broken in nearly a year of operation. To obtain these results required considerable experimentation and the cooperation of certain carbide manufacturers' representatives.

In the economical use of carbide tools for planing, it is of the utmost importance to employ planers of sufficient horsepower capacity; to have both the work and the cutting tool rigidly mounted; and to provide a means of lifting the clapper box on the return stroke of the planer table. The machines used in this plant are Cincinnati-Hypro double-housing planers, 78 by 72 inches by 20 feet long, and 66 by 56 inches by 20 feet long. These machines, of recent design, are equipped with 50- to 100-H.P. variable-voltage drives. The maximum table speeds guaranteed by the manufacturer are 300 surface feet per minute, but because of power conditions in the plant, a speed of 310 surface feet per minute is normally obtained.

However, even though these conditions were ideal, the very important point of tool design had to be considered if satisfactory results were to be obtained. At the start of the experimentation, a tool shank 1 1/2 by 2 1/2 by 12 inches was employed. The carbide insert, 1/2 by 3/4 by 1 1/2 inches, was brazed in a milled pocket with silver solder in the conventional manner. The tool was designed with a 5-degree negative top back rake, a 10-degree positive top side rake, 6-degree primary relief angles, 8-degree secondary relief angles, a 15-degree lead angle, a 15-degree clearance angle, and a nose radius of approximately 1/8 inch. The grade of carbide used was the so-called "straight tungsten" type having a medium hardness.

When this tool was put into use machining 35 to 40 per cent steel castings at table speeds between 240 and 300 surface feet per minute, with a feed of 1/16 inch and a depth of cut ranging between 1/4 and 1 inch, only about 6 inches of the surface was planed before tool failure occurred. On subsequent trials, the machine was stopped and the tool examined before failure occurred.

This examination showed that a severe cratering action was taking place on the top of the carbide insert, adjacent to and parallel with the cutting edge. It was decided that because of the high speeds used a peculiar type of chip formation was being obtained; the chip re-

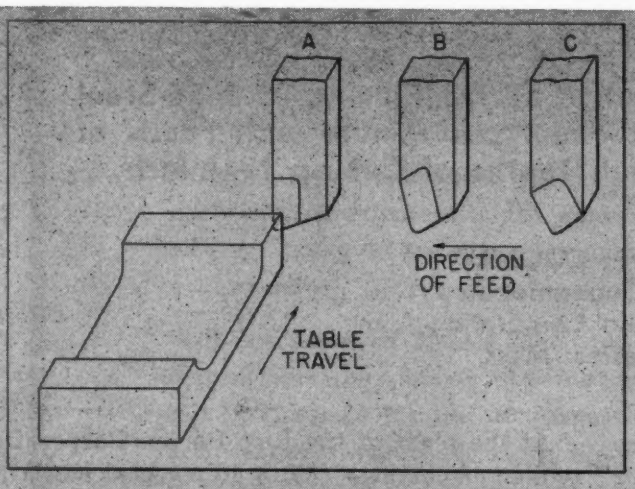


Fig. 1. (Above) As the Lead Angle of a Planer Tool is Increased, the Shock on the Tip when the Tool Enters the Work is Decreased, and the Initial Shock is Taken Higher up on the Carbide Tip, where there is Maximum Backing

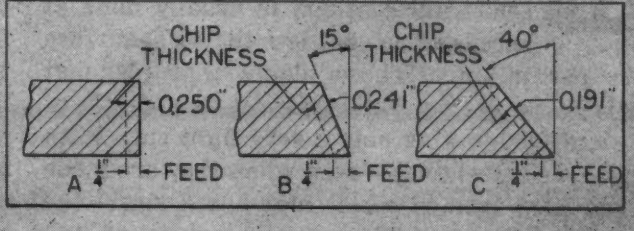


Fig. 2. (Below) Increasing the Lead Angle of the Tool while Maintaining a Constant Feed Decreases the Thickness of the Undeformed Chip. At A, B, and C is Shown the Chip Thickness when Using Tools having Lead Angles of 0, 15, and 40 Degrees, Respectively

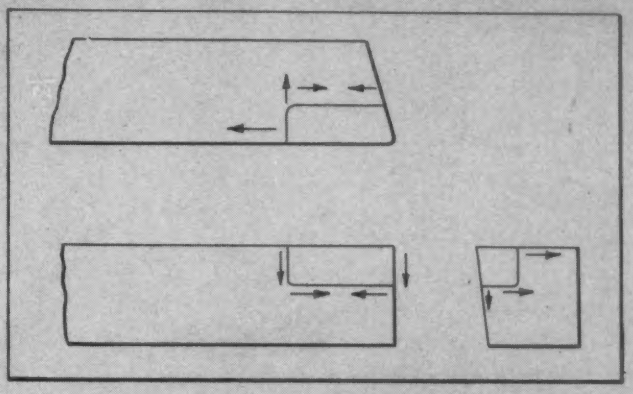


Fig. 3. When a Carbide Tip is Inserted in a Milled Cavity and Brazed Directly to Steel, Stresses are Set up in the Carbide on Cooling Because of the Difference in the Coefficients of Expansion of the Two Materials. This Eventually Leads to Fracture of the Insert

sembled somewhat the continuous type that commonly occurs in machining steel.

With this type of chip, which hugs the top of the tool tightly and contains the bulk of the frictional heat produced by the metal-cutting action, there is an affinity between the chip and the binder material—usually cobalt—of the sintered tungsten carbide. This affinity results in "washing out" the cobalt binder at the point of closest contact between the chip and the tool surface, the point being determined by the feed employed.

In this case, the cratering commenced at a point about 1/16 inch back of the cutting edge, and as the crater became progressively deeper, it moved closer and closer to the cutting edge. Finally the cutting edge was so weakened that it crumbled away, with the result that the blunt-edged tool fractured under the excessive cutting pressures produced.

To prevent such tool failure, a tantalum type of tungsten carbide, of medium hardness, was next tried. This type of carbide permits freer passage of the chip across the face of the tip and minimizes the cratering action. However, tool failure still occurred after a short cutting period. It was then decided that premature failure resulted from the excessive shock on the tool when it entered the work and when it was subjected to interrupted cuts. Accordingly, the cutting edge of the tool was strengthened by reducing the top side rake angle to 0 degrees and increasing the lead angle to 40 degrees.

The effect of changing the lead cutting angle is illustrated in Fig. 1. If the tool has a 0-degree lead angle, as shown at *A*, it enters and leaves the work at the full depth of cut. The complete shock load is taken along the entire cutting edge, thereby subjecting the carbide tip

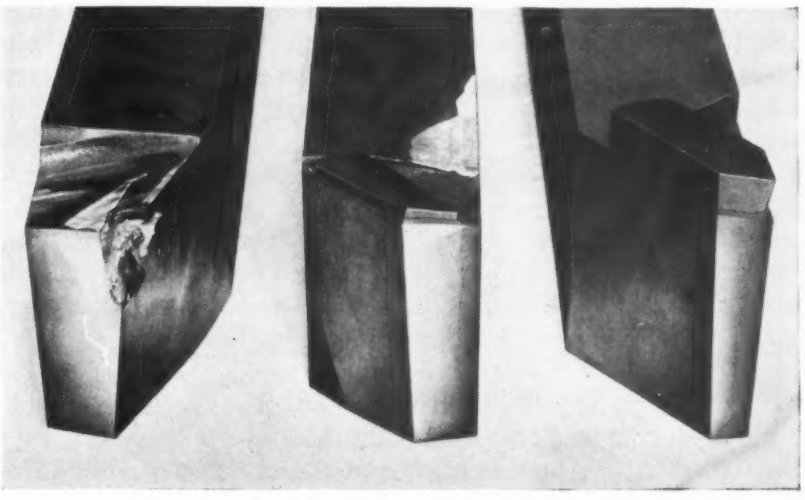


Fig. 4. On the Left is Shown a Conventional Carbide-tipped Tool which Broke after a Short Period of Operation at High Speed. At the Right is a Redesigned Tool, and in the Center is a Similar Tool after the Tip had been Worn and Ground down to 1/16 Inch

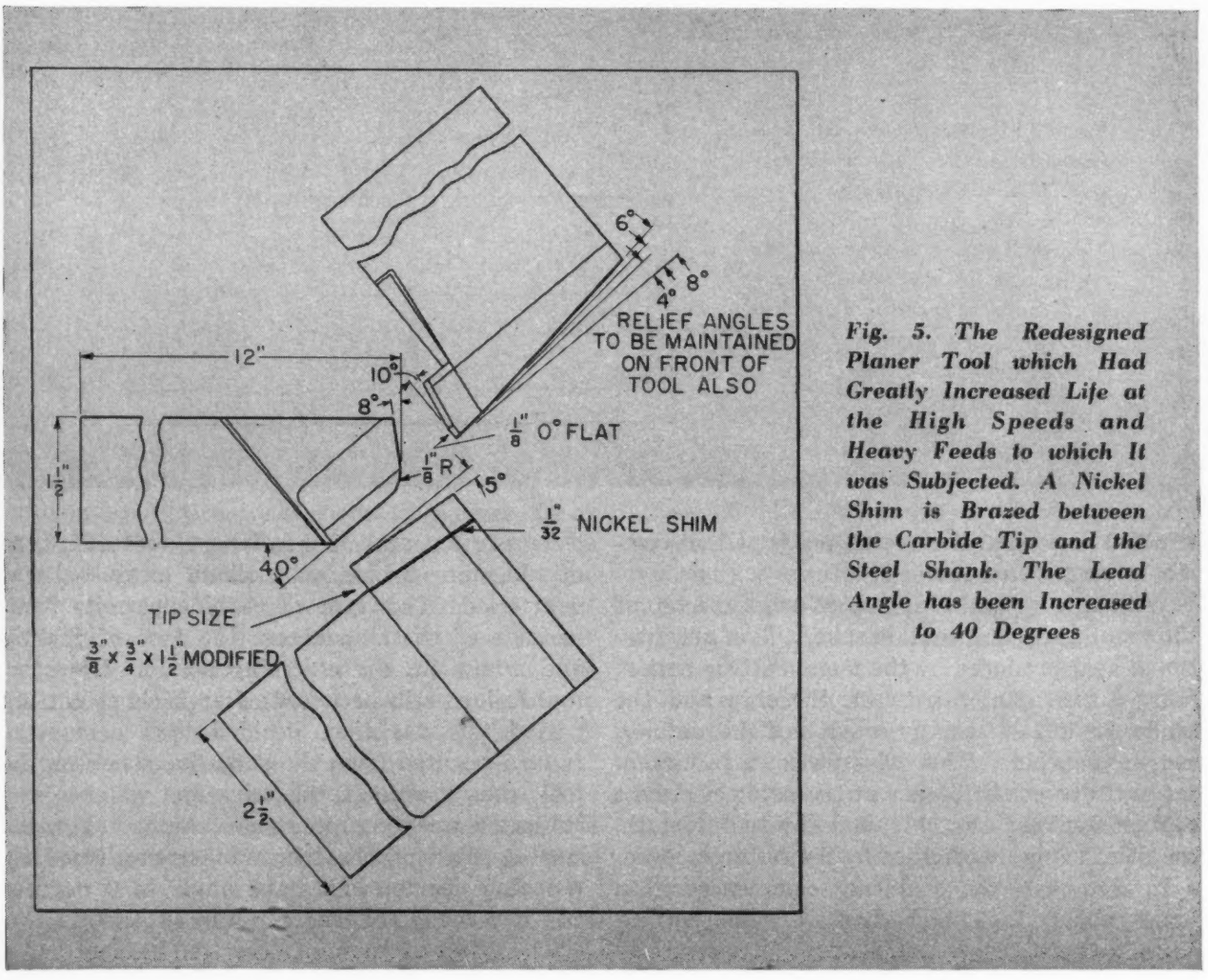


Fig. 5. The Redesigned Planer Tool which Had Greatly Increased Life at the High Speeds and Heavy Feeds to which It was Subjected. A Nickel Shim is Brazed between the Carbide Tip and the Steel Shank. The Lead Angle has been Increased to 40 Degrees

to maximum shock when it engages or leaves the work. When the lead angle is increased, as indicated at *B* and *C*, the cut begins gradually and progresses to full depth as the tool is fed into the work. The entering or initial shock is also taken higher up on the carbide tip, where there is maximum backing, and the finish of the cut or the "breakout" is accomplished more gradually.

This increase in the lead angle reduced the thickness of the chip, as shown in Fig. 2. With a constant feed of 1/4 inch, the undeformed chip has a thickness of 1/4 inch when cut with a tool having a 0-degree lead angle, as indicated at *A;* when cut with a tool having a 15-degree lead angle, the chip thickness is decreased to 0.241 inch, as seen at *B;* and when cut with a tool having a 40-degree lead angle, the chip thickness is decreased to 0.191 inch as at *C*.

With these changes in tool design, it was possible to keep a tool in continuous use for from three to five hours, but tip fractures and tool failures still continued. It was then decided that brazing stresses, which are always present when two dissimilar metals are joined by the application of heat, were being increased beyond a reasonable point, and that the fractures in the carbide were a direct result of this condition.

With this in mind, a 0.010-inch copper shim was brazed to the tool shank, and the tip, in turn, was brazed to the shim. That this step, by itself, resulted in no appreciable change in tool life was not surprising, in view of the fact that the carbide insert was contained in a milled cavity in the shank. Brazing stresses and the forces resulting from these stresses were thus exerted on three surfaces of the tip, thereby tending to deform the carbide insert.

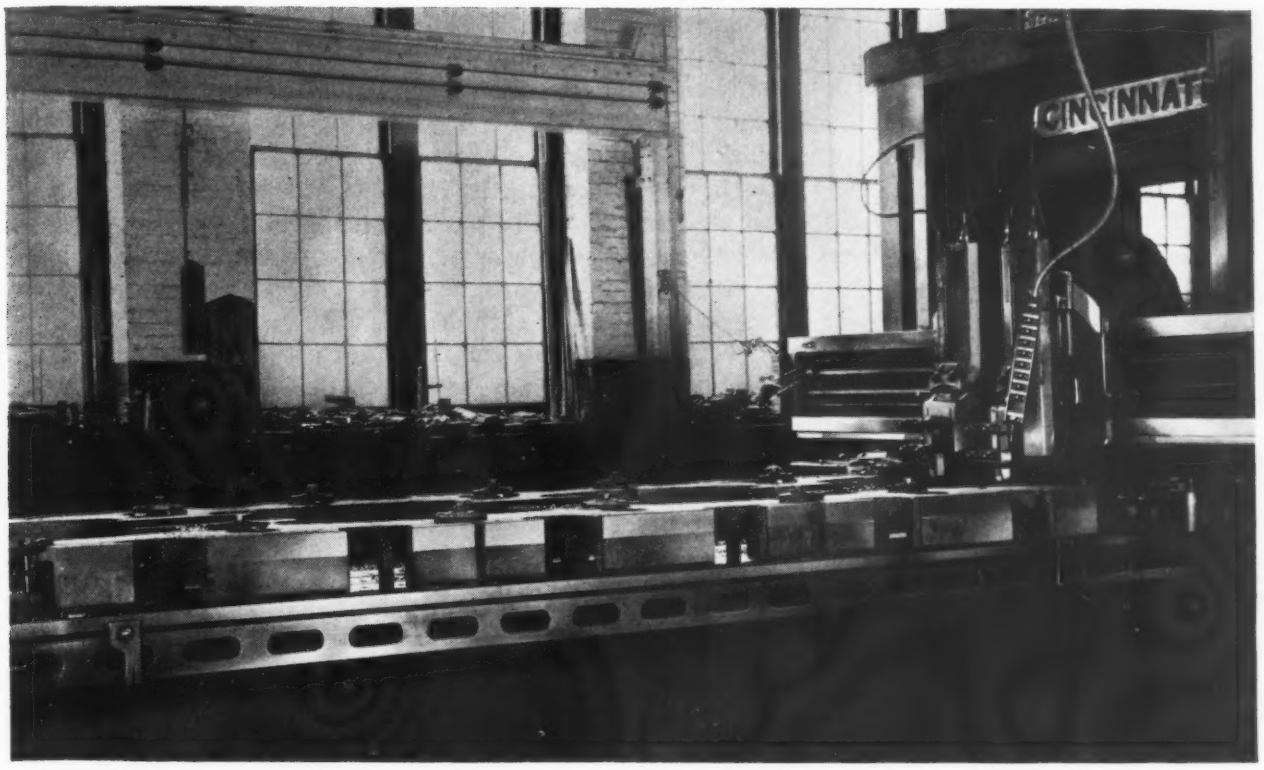


Fig. 6. Semi-steel Dryer Frames for Paper Machines are Planed at a Speed of 310 Feet per Minute. The Feed on This Job is 0.062 Inch and the Depth of Cut is 3/8 Inch

In the brazing process, heat is applied until the brazing material starts to flow; this occurs at a temperature of approximately 1240 degrees when silver solder is used as the brazing material. After the brazing torch is removed, a relatively small drop in temperature causes the silver solder to solidify, and the carbide insert is bonded to the shank of the tool. However, contraction of the steel shank and the carbide insert continues until the residual heat is dissipated. At ordinary brazing temperatures, the ratio of expansion of tungsten carbide to steel is approximately 2 to 1. Because of the difference in the amount of expansion and contraction between these dissimilar metals, stresses and strains are set up in the carbide material, as illustrated in Fig. 3. If the carbide is then subjected to excessive shock, fracture occurs.

To prevent this type of failure, the carbide insert was removed from the milled cavity and

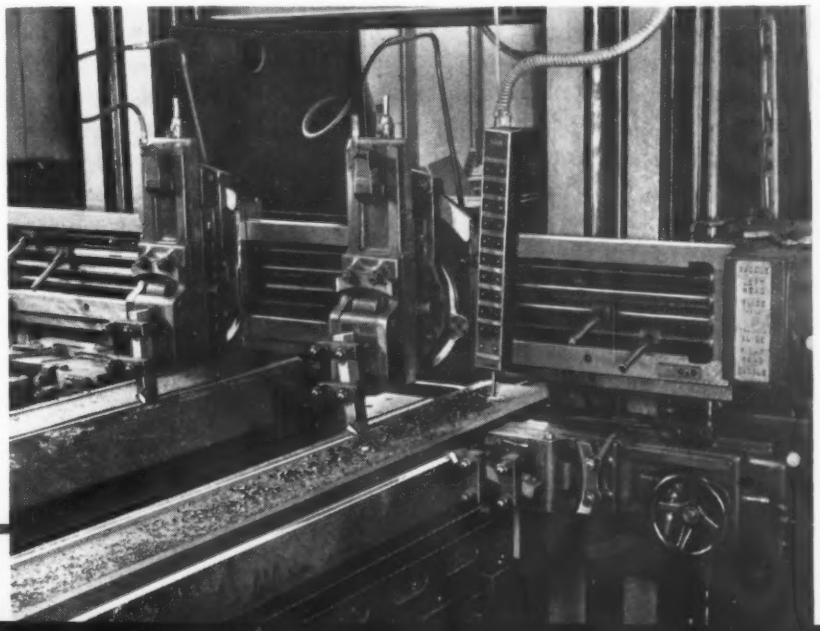


Fig. 7. Close-up View of the Planing of Other Parts for Paper Machines, Showing the Depth of Cuts Taken. Only Roughing and Striping Cuts are Made on These Parts, a Finishing Cut being Unnecessary

brazed on the bottom surface only to the top of a slash-milled shank. In some cases, tools of this design remained in use for a period of weeks, but spasmodic tool breakage still occurred.

Next, a nickel shim, 0.031 inch thick, was placed beneath the carbide insert, which was now on top of the shank. Nickel sheet of this thickness has a fairly high degree of elasticity, and it was believed that this shim would absorb the bulk of the brazing stresses remaining in the carbide insert. Because of the much higher melting point of nickel, it was possible to use either silver solder or copper as the brazing material without danger of melting the shim. It is also to be noted that no peening or deformation of the nickel shim took place when the tool was in operation, in spite of its thickness.

Fig. 4 illustrates graphically the difference in tool life resulting from the change in design described. On the left is a conventional carbide tool which fractured and broke after only a few minutes when being used to plane semi-steel castings at high speeds; on the right is a tool of the new type; and in the center is a tool of the new design that has been used until the carbide tip has been almost entirely consumed.

By designing the tools as described, and incorporating other slight modifications, it is now possible to plane consistently at the previously mentioned speeds, feeds, and depths of cut, with a minimum of tool breakage.

The final tool, shown in Fig. 5, is designed with a 5-degree negative top back rake; a 10-degree positive top side rake and a land of approximately 1/8 inch at 0 degrees for ease of grinding; a 40-degree lead angle; an 8-degree clearance angle; a 6-degree primary relief angle; an 8-degree secondary relief angle to the bottom of the carbide tip; a 10-degree relief angle on the steel shank; and a nose radius of about 1/8 inch. The brazing material employed is silver solder ("Easy-Flo" No. 3) for torch brazing or copper for hydrogen-atmosphere furnace brazing. It was also found that carbide costs could be reduced by using a tip 3/8 inch thick rather than the 1/2-inch tip used originally. The tungsten carbide now used is one of the softer grades—either the tantalum or titanium type.

Some typical parts that are planed with these tools are shown in Fig. 6. They are bottom dryer frames for a paper machine and are planed at a speed of 310 surface feet per minute. There are nine interrupted cuts on this job. The feed is 0.062 inch and the depth of cut 3/8 inch. Other parts that have been rough-planed at high speeds are illustrated in Fig. 7. The depth of the cut made by the tool mounted on the side-head is visible in the illustration.

Tool and Die Courses Advocated for Engineering Colleges

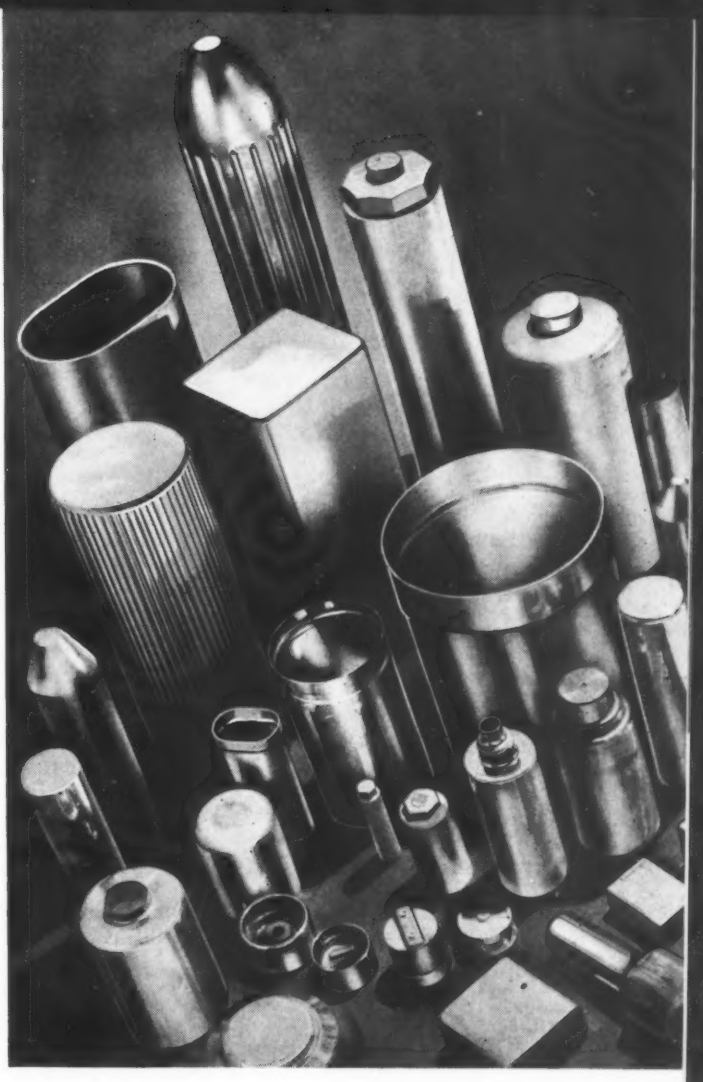
IMPENDING demands of a rearmament program and stepped-up production in manufacturing plants have emphasized the shortage of expert toolmakers, brought about by the lack of apprenticeships during the depression and the war years which followed. It has been said that this country lost an entire generation of toolmakers, and comparative statistics seem to justify such a statement. In Germany, for example, at the beginning of World War II there were 225,000 toolmakers in a population of about 65,000,000 persons, while in this country, there were only 87,000 in a 130,000,000 population.

The stamping industry has been particularly sensitive to the shortage of trained toolmakers and diemakers because the management in this industry is largely recruited from that group of workers. The industry, therefore, has initiated, through the Pressed Metal Institute, a program of cooperation with vocational high schools and engineering colleges which should interest a growing number of young men in making careers for themselves in the pressed-metal field. In 1947, the Institute sponsored the establishment of a one-semester course in die design at Toledo University. This program has now developed into a three-semester course. Because of its success, the Institute is advocating the adoption of similar courses in schools and colleges located in stamping centers.

Impact Extrusions
Their Design and Production

Advantages, Limitations, Production Methods, and Application of Impact Extrusions — First of Two Articles

By HERBERT CHASE



EXTRUSIONS of cup-like form are among the metal products well adapted to quantity production on a rapid and efficient basis. These impact extrusions are quite different from continuous extrusions, such as long tubes, bars, and special shapes produced from heated billets in hydraulic presses. The continuous extrusion generally constitutes only a partly fabricated product having the same general character as bars, shapes, and tubes produced by rolling or drawing.

As opposed to this, the impact extrusion is usually practically complete and ready for use upon ejection from the impact press, although trimming to length and certain other secondary operations are commonly needed. In this respect, the impact extrusion is comparable to a drawn cup made from sheet stock in a stamping press. Although the extrusion differs from the drawn part in some respects, there are applications in which the two are identical in shape and can be used interchangeably.

Impact extrusions are produced by striking slugs of metal in dies with sufficient pressure to cause the metal to flow between the die and the punch. This results, as a rule, in producing cup-shaped parts in a single blow. Generally, the walls of the cup are thinner than the bottom, and are of fairly uniform thickness. The bottoms of impact extrusions often include bosses, either inside or outside, and can include flanges or nozzle-like extensions or necks through which a hole can be formed.

Since the impact extrusion involves a considerable flow of metal, it can be made commercially only from rather soft and ductile metals. Harder metals require too much pressure to produce the necessary flow.

The advantages afforded by impact extrusions may be summarized as follows:

1. Production is unusually rapid, a common rate being from thirty-five to seventy pieces a minute.
2. Each piece is substantially a duplicate of all others extruded from the same tools.
3. Material waste is slight, scrap often being used again in the same plant.
4. Labor cost per piece is small.
5. Tolerances attainable compare favorably with those for similarly shaped drawn and cast products.
6. Variations in thickness of head and bosses, generally not feasible in drawn products, are readily provided.
7. Walls of tubes can have longitudinal ribs inside or outside, and can be fluted.
8. Dies are low in cost, generally less than deep-drawing dies, and except for blanking of the slugs, only a single die is needed.
9. Cups much deeper than can be produced in a single drawing operation are readily obtained in one extrusion operation.

10. Freedom from porosity and other advantages of wrought metals are attained.

11. Smoothness and appearance are excellent, and most metals used have good corrosion resistance.

12. Many forms of finish are readily applied with minimum surface preparation.

13. Seams and joints are eliminated.

14. Such secondary operations as are needed are rapidly and simply performed at low cost.

Limitations of impact extrusions include the following:

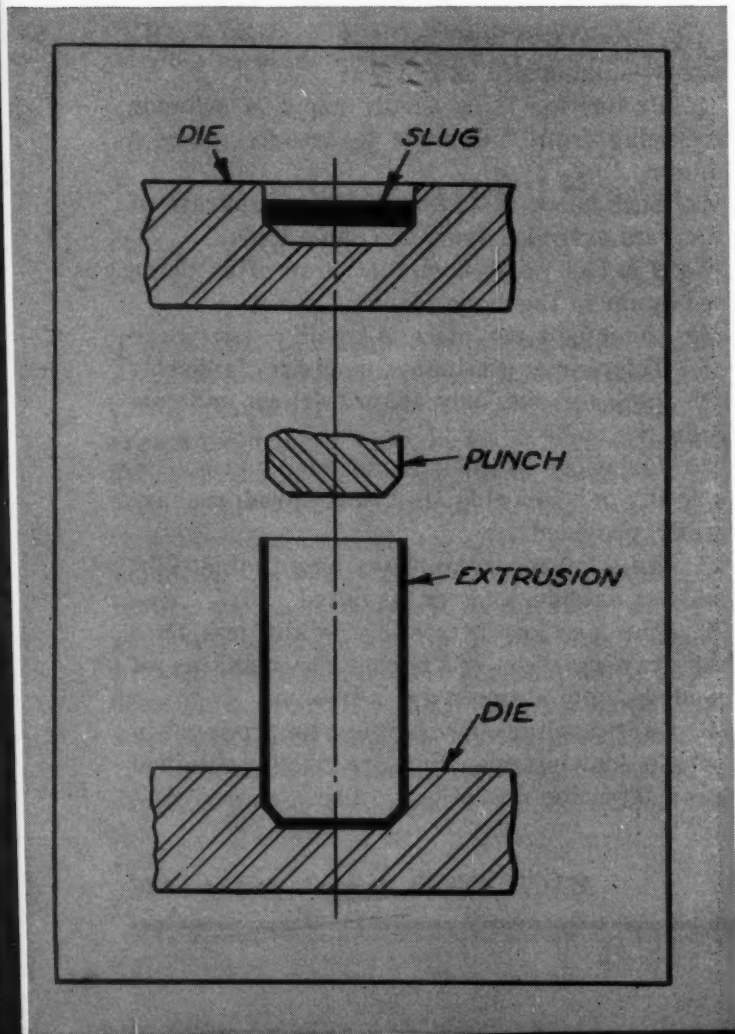
1. Shapes and sizes are more limited than in stamping and casting.

2. The limited number of metals and alloys suitable for impact extrusion are non-ferrous and most of them are soft or low in strength or both.

3. Many properties are inferior to those attainable in products of the same shape produced by other means.

4. Somewhat specialized equipment and technique are required.

5. Slugs must be cut from strips, sheet, or rod stock that has already undergone processing and is not low in cost.



Method of Producing Impact Extrusions

An impact extrusion, as mentioned, starts with a slug of metal, usually a circular disk blanked from sheet stock. Occasionally, however, if the thickness of the slug must equal or exceed its diameter the disk is cut from bar stock. Slugs are commonly produced by gang punches from strip stock and should be so sized as to be a fairly close fit in the die recess. The slug can be circular, square, oblong, or elliptical, depending upon the cross-section desired in the extrusion. Sharp-cornered shapes cannot be extruded, with the exception of bosses, and even in such cases, rounded corners and fillets are preferred. For certain types of dies, slugs having a central hole are needed.

All impact extrusion dies are made of hardened steel. Usually, they have a solid bottom against which the slug fits. The punch is commonly of circular section and is enough smaller in diameter than the die ring to leave an annular space through which the metal is extruded. As the punch descends, it strikes the slug which, under the impact, is forced to flow. This first causes the slug to fill the die cavity completely, including any holes in which bosses are to be formed. Then, in the common form of die, such as shown in Fig. 1, the slug is extruded upward through the annular space around the punch, forming a tube. Flow is completed in a fraction of a second. The extrusion thus formed sticks to the punch and is stripped on the up stroke.

In the Hooker form of die, Figs. 2 and 3, the body of the punch fits the die ring closely, but it usually has a central extension of smaller diameter that passes through a hole in the slug and enters a hole in the bottom of the die. The latter hole is larger than the punch extension and metal is extruded through the annular space between the extension and the hole by the step or shoulder on the punch. The resulting extrusion is a tube having the same section as the annular space, and with an external flange equal in outside diameter to that of the punch body. An ejector pin, shown below the die in Fig. 2, is often used to push the extrusion out of the die.

If the punch has no extension, no hole is need-

Fig. 1. Common Form of Impact Extrusion Die, Showing the Slug before it is Struck and the Resulting Extruded Cup

ed in the slug, and the metal extruded through the hole in the die forms a solid bar. Cup-like preforms, as shown at the left in Fig. 3, are sometimes used, and then the extrusion can have a bottom. The walls of the extrusion nearly always have a uniform thickness from end to flange, but they can be made to taper if the punch extension is tapered, as seen at the right.

Impact extrusions usually include a bottom or flange (which is really a forging) and a tubular portion produced by extruding part of the metal through an opening around the punch or an extension of the punch. The forged portion often includes a central boss or nozzle-like extension, but eccentric bosses can be formed. The tube can be short and thick if desired, and, as in producing caps for collapsible tubes, the punch can have an annular recess into which the tubular portion is extruded. In this case, the outside diameter of the punch fits the die hole closely and a flange is formed, as seen in Fig. 4.

After the extrusion is stripped or ejected, it commonly undergoes one or more finishing operations. Usually, the end of the tubular portion is irregular and is trimmed square with a circular cutting tool. Also, the bottom can be cut off, leaving only a tube, or it can be pierced or have the end of the nozzle-like extension cut off. If desired, the tube can have one or more beads rolled in, as in Fig. 5, or it can be pierced, slotted, or flattened and then folded over and crimped.

Often the extension formed on the bottom of the extrusion has a thread rolled or cut on the outside diameter. Also, circular holes in the part can be tapped if desired. Other secondary operations, such as knurling, are often performed, and finishes can be applied either internally or externally, as on other metal products. Caps of different shapes are often extruded for application to other extrusions or to products that are not extruded.

Most impact extrusions are made in crank presses, many of which are equipped for automatic operation, including the feeding of the slug and the stripping or ejection of the product. A production rate of one piece a second is often attained. Products required in large volume, such as tubes for pastes of various types, are often handled automatically when performing secondary operations like trimming, threading, enameling, and lithographing.

Scrap, produced chiefly when slugs are pierced out of strip stock, is melted and rerolled. Consequently, there is almost no loss of metal, and as the extruding and secondary operations are rapid, the labor charge per piece is very low. For some sizes and shapes of parts, total costs are below those for equivalent blanked and drawn products made from the same metal. However, many metals that can be drawn are not suitable for impact extrusion. In metals that can be worked by either process, extrusion is generally chosen when the ratio of length to diameter is large. Impact extrusions in which the bottom is substantially thicker than the walls cannot be duplicated, as a rule, by blanking and drawing operations alone.

Applications of Impact Extrusions

Up to the present time, some 95 per cent of all impact extrusions have gone into tubes for pastes, ointments, and the like, primarily be-

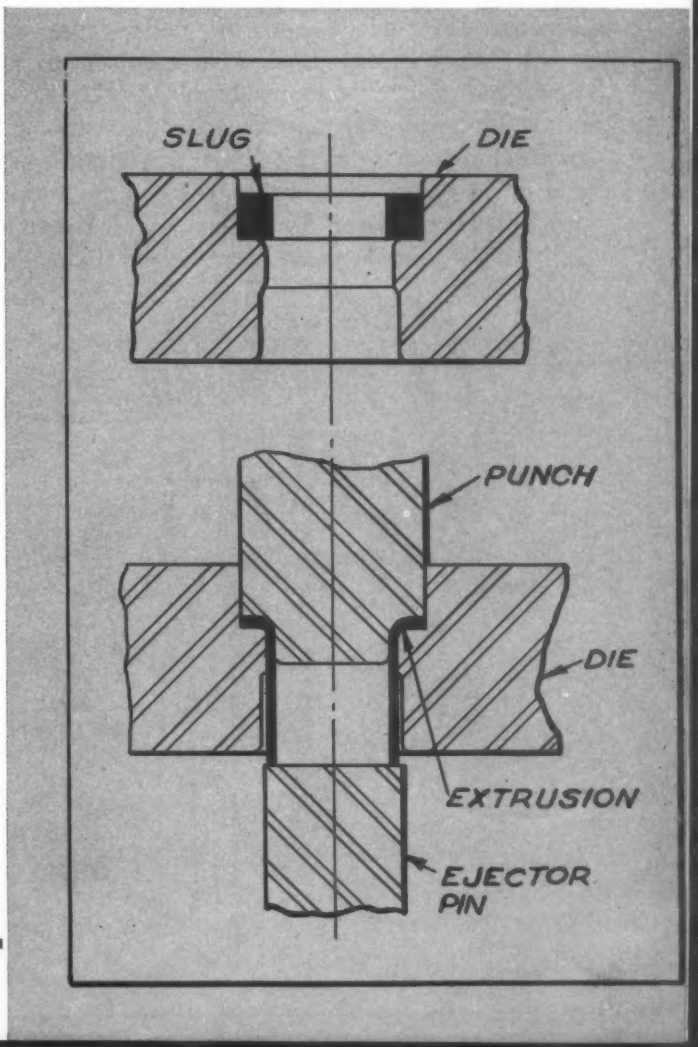


Fig. 2. Hooker Type of Die. Here a Short Flanged Tube is Extruded Downward between Punch Extension and Die Hole

cause the product is ideally suited for such use and the demand in that field is so large. There is, however, a large production of impact extrusions for other than packaging purposes. Some of these are shown in Fig. 6 and in the heading illustration. They include so-called "cans" for condensers, dry cells, transformers, and radio shields. Tubes produced by impact extrusion are used as cases for flashlights, cylinders of various types (such as those used in small pumps and dashpots), ignition parts, and fire extinguisher parts.

Applications are not confined to parts having circular sections. Tubular parts can be fluted or have beads inside or outside, parallel to the axis. Square, oblong, elliptical, hexagonal, and other shapes can be produced. Corners on non-circular tubular sections, however, must have large radii. The bottoms of parts can have square, oblong, or polygonal bosses, and are often conical rather than flat. Such considerations tend to extend the possible fields of application. Size and available materials are the major limitations.

Soft, Ductile Materials are Most Suitable for Impact Extrusions

Impact extrusions can be made from any metal that is sufficiently soft and ductile to undergo the severe working involved. However, partly for economic reasons, mass production is confined primarily to lead, tin, aluminum, and zinc or to alloys of these metals. Some copper and brass extrusions have been made commercially, chiefly in Hooker dies. Also, silver and magnesium can be impact extruded, at least on an experimental scale.

Most impact extrusions are made from slugs at room temperature, but in some cases, the slugs are heated before being placed in the die. Also, the slugs are sometimes tumbled in a lubricant, which facilitates the extrusion and removes burrs that may interfere with loading into the die.

Many extrusions are made from tin-clad lead-alloy stock, produced by a rolling operation in which a thin coating of tin is made to adhere permanently to the lead alloy. This is done primarily to obtain the advantage of the high corrosion resistance of tin under conditions where tin is scarce. It may also reduce metal costs. In addition, a cladding of tin gives a brighter finish than lead or lead alloys afford.

Lead is readily extruded in its pure form, but the resulting extrusion is too soft to hold its shape. For this reason, an alloy containing about 3 per cent of antimony is commonly used to obtain the necessary strength and stiffness. Copper has been employed as an alloying agent in cases where antimony was scarce.

Although lead is rated high in corrosion resistance, it is subject to some tarnishing. When not clad with tin, the lead is usually given a coating of lacquer where contact with corrosive agents is contemplated. As with other metals, a suitable ground coating is applied when lithographing or similar operations are to be performed.

Since lead is comparatively low in cost and extrudes so readily, it has attained the widest

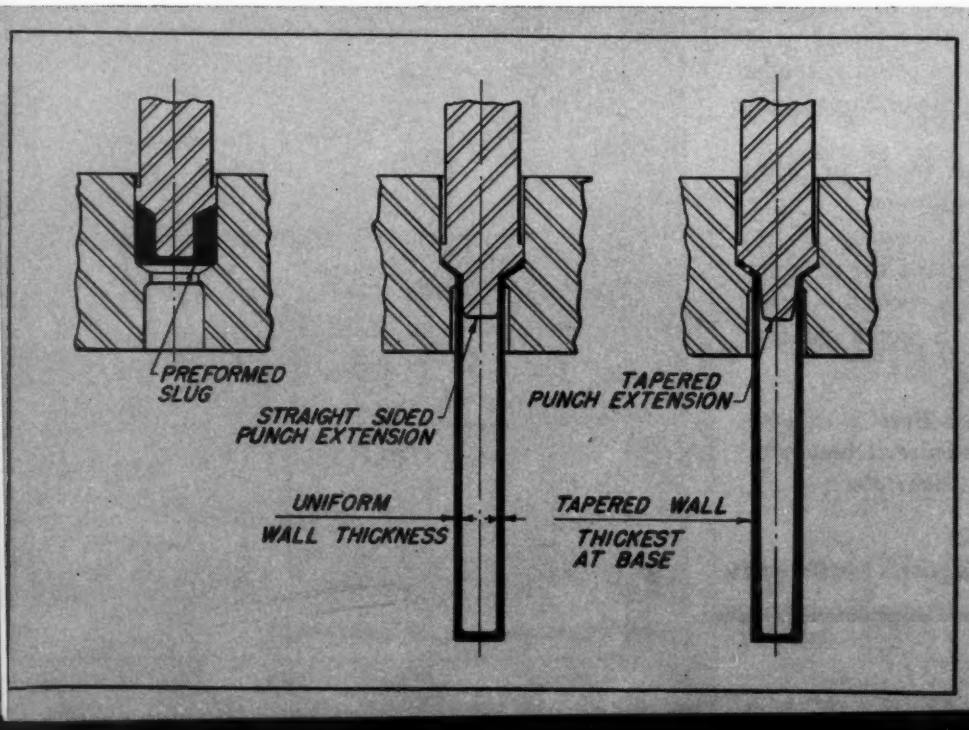


Fig. 3. (Left) Hooker Type Die with Hollow Preformed Slug in Place. (Center) Impact Extrusion that is Formed with Walls of Uniform Thickness. (Right) Extrusion Having Walls that are Tapered by Punch with Tapered Extension

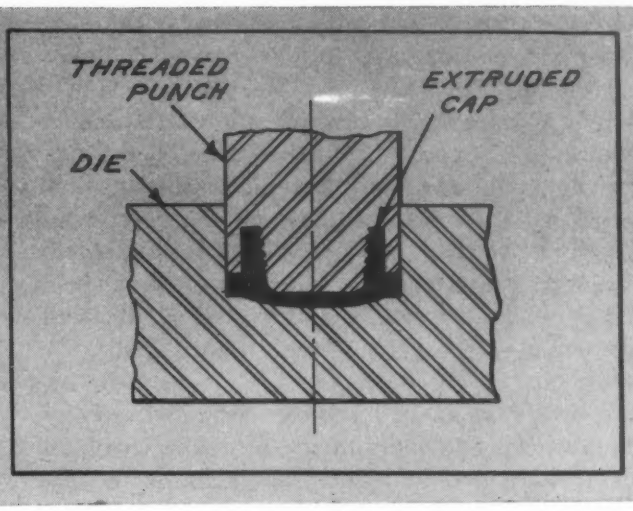


Fig. 4. Cap, Such as is Used on Collapsible Tubes, Produced by Extruding around the Threaded Portion of the Punch, the Cap afterward being Unscrewed

use, chiefly as collapsible tubes for which the demands are large, as previously mentioned. However, lead alloys are too soft for most other uses.

Aluminum ranks second in extent of use for impact extrusions. It is widely applied for making thin-walled collapsible tubes, but is also well suited for many other industrial applications. Aluminum of high purity is the easiest to extrude, and 99.7 per cent purity is commonly required for thin-walled collapsible tubes. The extrusion becomes hard as a result of the cold-working, and must be annealed before it can be used as a collapsible tube. Annealing is not required with lead-alloy tubes.

Practically pure aluminum (2S) is commonly chosen for rigid extrusions. Strong, hard, and stiff extrusions, well suited for use as tubes or cup-like parts, result. Although other aluminum alloys, such as 53S, 61S, and A51S, can be extruded by impact if the walls of the part to be extruded are not too thin, these alloys harden rapidly, making extrusion more difficult. Some experimental work has been done with 17S and other high-strength aluminum alloys, using heated slugs in certain cases.

Aluminum impact extrusions have a bright surface finish that is resistant to some forms of corrosion and holds its luster for long periods in most indoor uses. Coatings of lacquer or enamel or oxide coatings are often applied, however, both for decorative and corrosion protective purposes.

A zinc alloy containing 0.20 per cent lead, 0.07 per cent cadmium, and 0.01 per cent iron is readily extruded and ranks next to aluminum in extent of use for impact extrusions. The strength

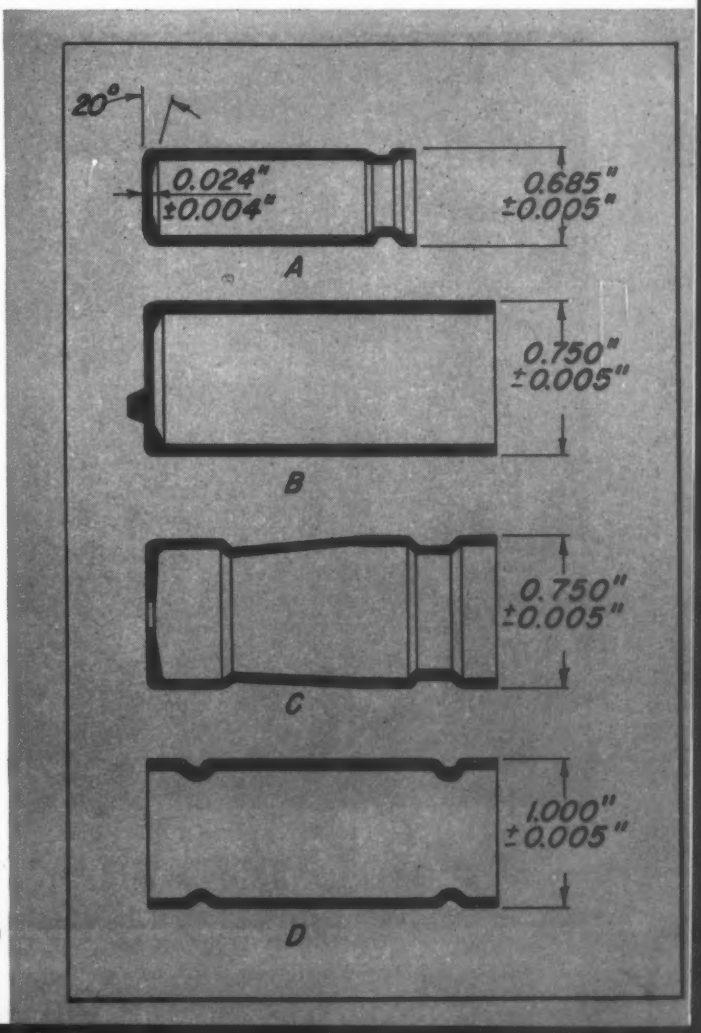


Fig. 5. Typical Zinc Impact Extrusions: (A) Cup with Rolled Bead; (B) Straight-walled Cup with Offset Square Boss on Outside of Bottom; (C) Cup with Hole in Bottom and Walls Rolled to Form Bead and Tapered Portion; (D) Tube with Two Rolled Beads, the Bottom having been Cut off

and stiffness of this alloy are ample for many uses. Slugs are heated to 300 degrees F. before extrusion. Extrusions of this metal have a bright surface finish, but are subject to tarnishing, and if exposed to moisture without first being coated, may show white corrosion on their surfaces. Enamels, lacquers, or electrolytic finishes are readily applied. Applications are chiefly for electrical uses, as in condensers and as shells for dry cells. Especially in the latter application, there is keen competition with drawn shells.

Tin makes excellent, though rather soft, impact extrusions. It has been used extensively, chiefly for collapsible tubes, when supplies of the metal were available for that purpose. As the average wall thickness in these and other collapsible tubes approximates 0.004 inch, the metal cost per tube is moderate.

Some tubes are extruded from pure tin, but 0.5 to 1.0 per cent of copper and small amounts of bismuth or zinc are sometimes added to increase the stiffness. In cases where tin is used as cladding for collapsible lead tubes, the tin content is commonly held to 3 per cent of the total weight.

Tin is preferred to lead when cost differentials are not too great and tin supplies are plentiful, because of its brighter color and unusually high resistance to corrosion. In addition, tin is not so soft as lead.

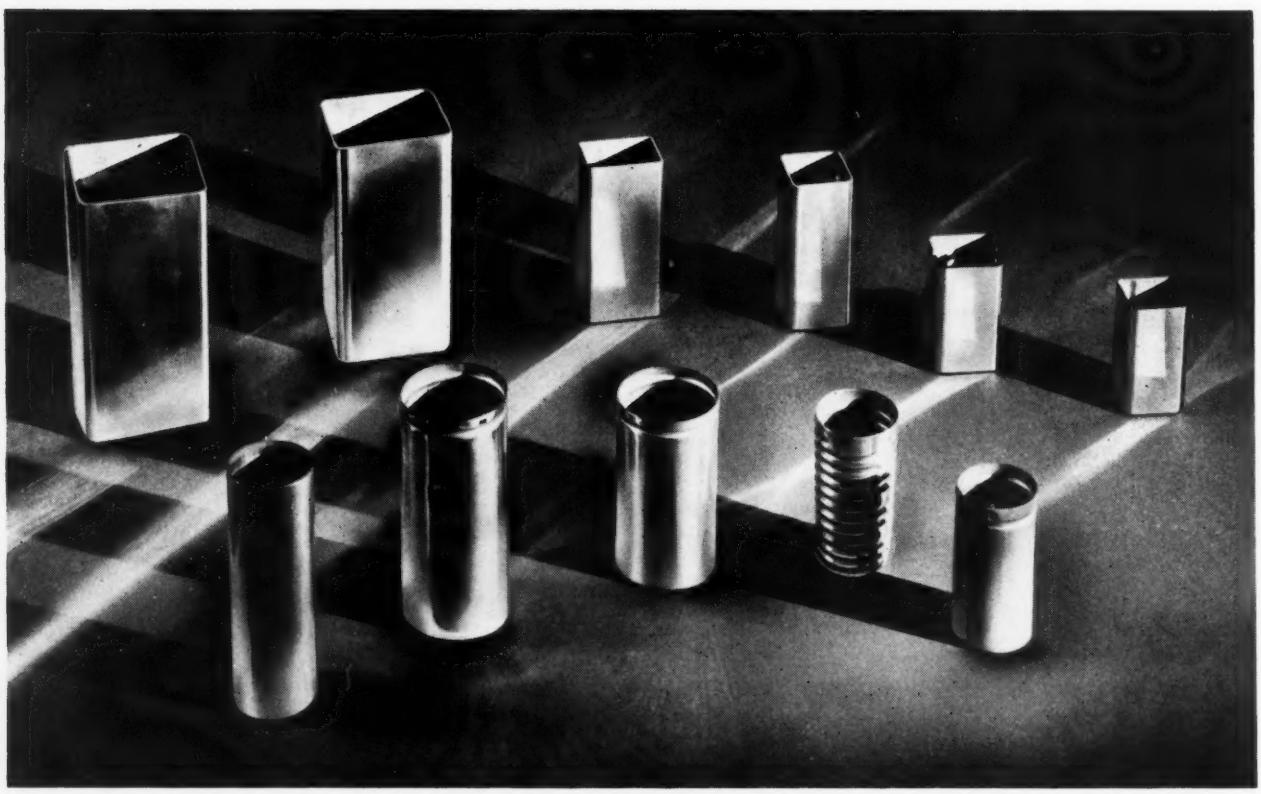
The concluding installment of this article will deal with the design of impact extrusions including production considerations and tolerances.

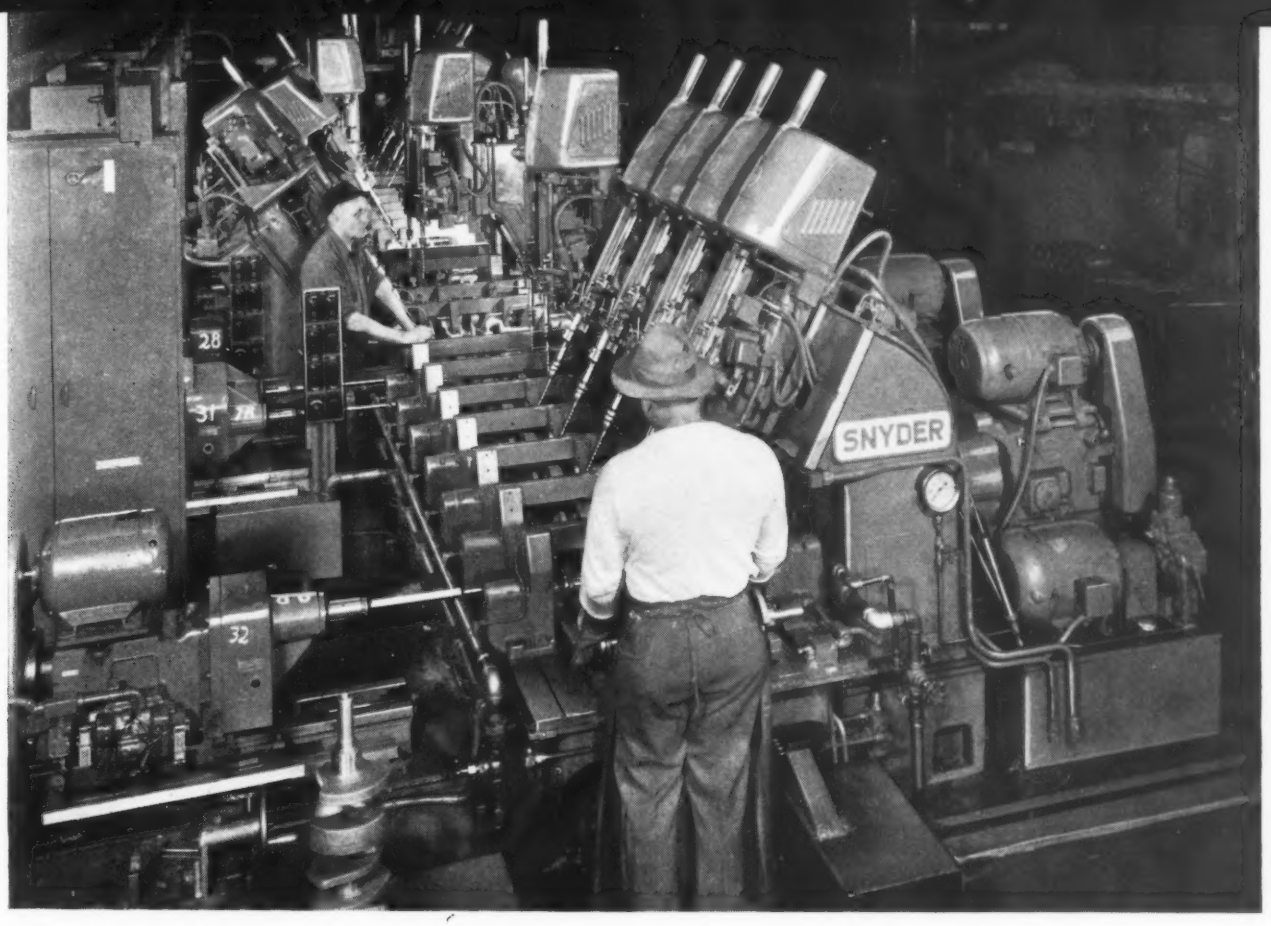
* * *

Index to A.S.T.M. Standards

The American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., has recently brought out a revised edition of its "Index to A.S.T.M. Standards." The new book enables any of 1500 standard specifications and tests in the 1946 book of standards and the 1947 supplement to be readily located. All items are listed by subject and, in addition, a list is given of the specifications and tests in numerical sequence of the serial designations. Copies of the new index can be obtained without charge upon written request to the Society.

Fig. 6. Typical Examples of Zinc Extrusions, All of which have been Trimmed to Length in Secondary Operations





Deep-Drilling of Crankshafts on Transfer Type Machines

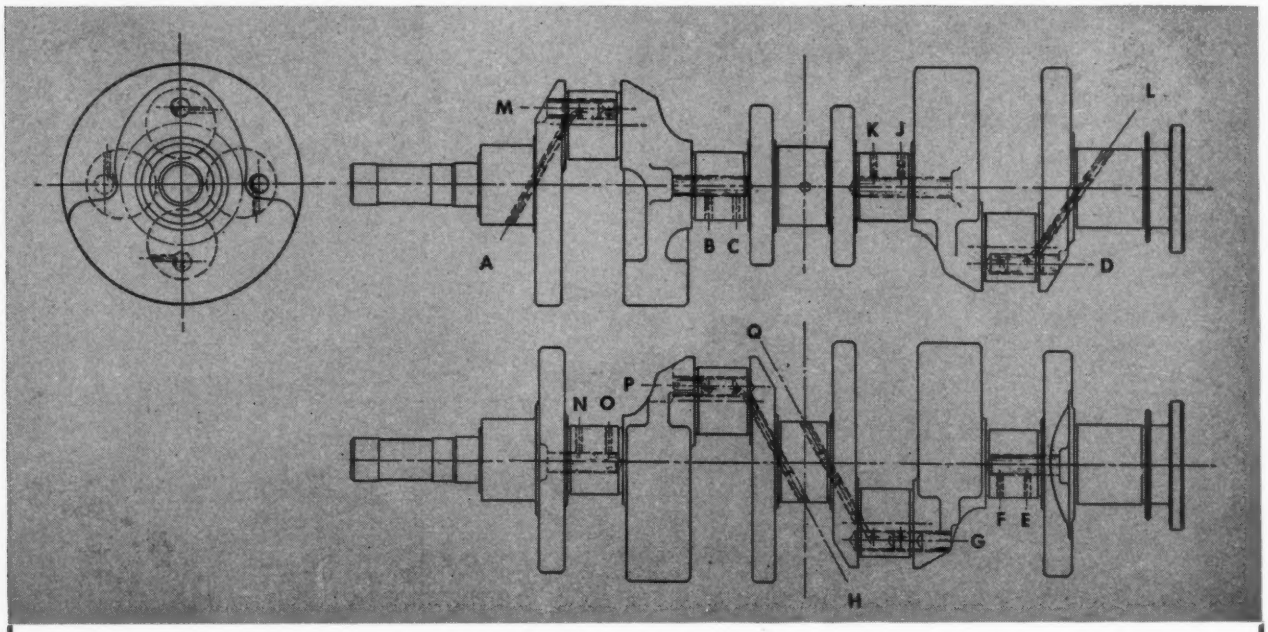
All the Horizontal, Vertical, and Angular Oil-Holes in Ford and Mercury Crankshafts are Drilled in Completely Automatic Transfer Type Machines at a Production Rate of Sixty Crankshafts per Hour

By CHARLES H. WICK

DRILLING of deep, angular oil-holes in crankshafts has always been a troublesome and time-consuming operation for automotive manufacturers. Until recently the production rate for this operation at the Rouge plant of the Ford Motor Co. was eighteen crankshafts per hour, with one operator attending three machines. Late in 1947, the design of the Ford and Mercury cast-steel crankshafts was changed and twelve extra holes were added, making a total of sixteen holes to be drilled, as indicated in the illustration shown in the accompanying table.

Production was greatly increased, despite the additional drilling required, by designing an entirely new machine of the progressive "in line" type. As shown in the heading illustration, all the angular, vertical, and horizontal holes are progressively drilled as the crankshafts are automatically transferred through the machine, a production of sixty crankshafts per hour being attained. Two operators are required—one for loading and one for unloading.

These machines were designed and built jointly by the Ford Motor Co., H. R. Krueger & Co., and the Snyder Tool & Engineering Co. Two of the machines consist, each, of sixteen Leland-Gifford drilling units with hydraulic step-feed



Operations Performed on Automotive Crankshafts at Various Stations of Transfer Machine

Station	Hole	Operation	Tool Diam., Inch	Depth of Hole, Inches	Tool Length, Inches	Speed of Tool, R.P.M.
1	—	Load	—	—	—	—
2	A	Drill	1/4	1.06	10 1/2	610
	B	Drill	3/16	1.06	8	800
3	A	Drill	1/4	2.12	10 1/2	610
	C	Drill	3/16	1.06	8	800
4	—	Idle	—	—	—	—
5	A	Drill	1/4	3.18	10 1/2	610
	D	Drill	39/64	0.50	10	258
6	A	Drill	1/4	4.26	10 1/2	610
	D	Ream	0.625	0.44	9	150
7	—	Idle	—	—	—	—
8	E	Drill	3/16	1.06	8	800
9	F	Drill	3/16	1.06	8	800
10	G	Drill	39/64	0.88	16 5/8	258
	H	Drill	1/4	1.06	10 1/2	610
11	G	Ream	0.625	0.76	15 5/8	150
	H	Drill	1/4	2.12	10 1/2	610
12	H	Drill	1/4	3.18	10 1/2	610
13	H	Drill	1/4	4.26	10 1/2	610
14	—	Idle	—	—	—	—
15	J	Drill	3/16	1.06	8	800
	L	Drill	1/4	1.12	10 1/2	610
16	K	Drill	3/16	1.06	8	800
	L	Drill	1/4	2.26	10 1/2	610
17	—	Idle	—	—	—	—
18	L	Drill	1/4	3.38	10 1/2	610
	M	Drill	39/64	0.50	11 1/2	258
	G	Drill	39/64	1.88	19	249
19	L	Drill	1/4	4.50	10 1/2	610
	M	Ream	0.625	0.44	10 3/4	150
20	—	Idle	—	—	—	—
21	N	Drill	3/16	1.06	8	800
	D	Drill	39/64	1.62	14 3/8	258
22	O	Drill	3/16	1.06	8	800
	D	Drill	19/32	2.10	15	258
	P	Drill	39/64	1.12	16	258
23	P	Ream	0.625	0.76	14 3/4	150
	Q	Drill	1/4	1.06	10 1/2	610
24	Q	Drill	1/4	2.12	10 1/2	610
25	Q	Drill	1/4	3.18	10 1/2	610
	P	Drill	39/64	2.00	16 5/8	255
	M	Drill	39/64	1.62	16 5/8	255
26	Q	Drill	1/4	4.26	10 1/2	610
	P	Drill	19/32	2.90	17 1/2	255
	M	Drill	19/32	2.10	17 1/2	255
27	G	Drill	19/32	2.36	19	249
28	—	Unload	—	—	—	—

attachments, arranged in groups of four units to progressively drill the angular holes; eight Leland-Gifford hydraulic units arranged in pairs to drill the vertical holes; and eight W. F. & John Barnes self-contained hydraulic units arranged with one, two, or four spindles to drill and partially ream the horizontal holes.

The hydraulic step-feed attachment automatically withdraws the drill from the hole when a predetermined depth has been reached. The drill is then advanced again until it reaches a second pre-set depth, and this cycle is repeated until the hole is completed or the desired depth has been reached for that particular drill. The factors that determine the depth to be drilled in each step are drill life and accuracy obtained. In general, the depth per step is equal to the drill diameter.

Two similar crankshaft drilling machines employ "Avey-Draulic" hydraulically fed, mechani-

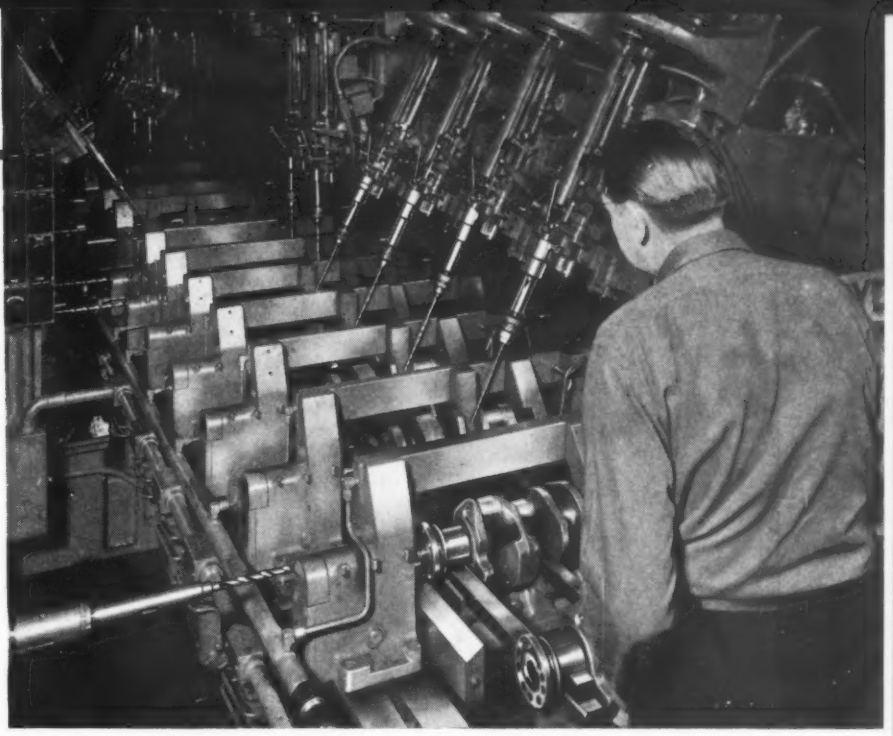
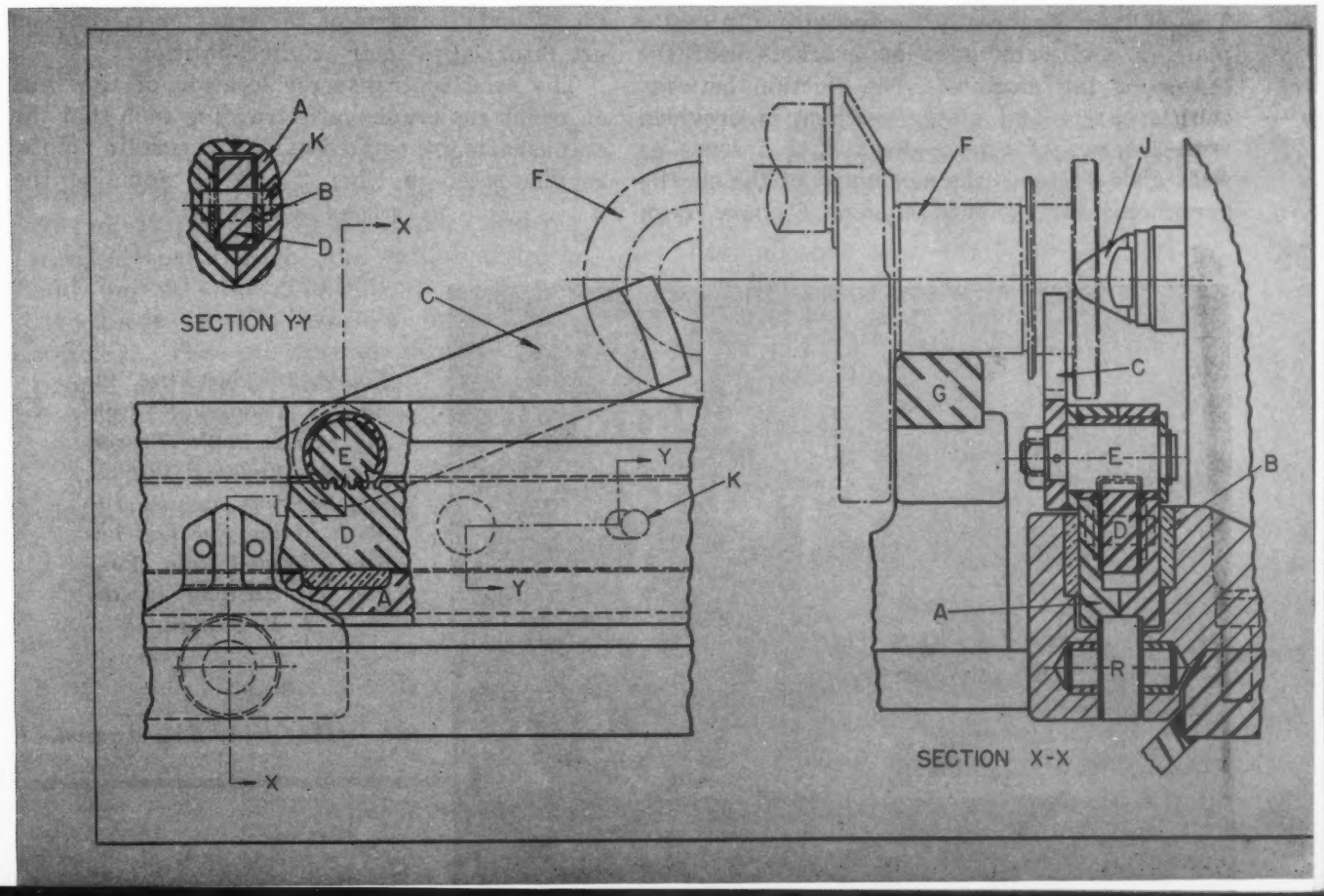


Fig. 1. (Right) Loading End of a Transfer Type Machine that Drills All Oil-holes in Automotive Crankshafts at the Rate of Sixty per Hour

Fig. 2. (Below) Sectional Views of Part of the Transfer Mechanism Used on the Automotive Crankshaft Drilling Machine

cally and electrically controlled drilling units. The "Torque-Matic" control on these units automatically withdraws the drills to allow the chips to escape. Torque applied to the spindle drive sleeve through cams is controlled by a pre-set amount of spring pressure on the cam-plate. When the torque is increased through excessive chip accumulation or variations in hardness of the metal, the drill is automatically withdrawn from the hole by a switch-operated solenoid.

There are twenty-eight stations on each machine—twenty-one machining stations and five idle, one loading, and one unloading stations. An operator simply loads a crankshaft at one end of the machine and presses a button to start the automatic cycle. The crankshafts are automatically advanced 16 inches from one station to the next by a shuttle bar of unique design, and locked in a fixture between two hydraulically operated centers at each station. The shuttle bar is then automatically returned to its original position, ready for another loading and indexing. The indexing cycle cannot begin until all the machining operations have been completed



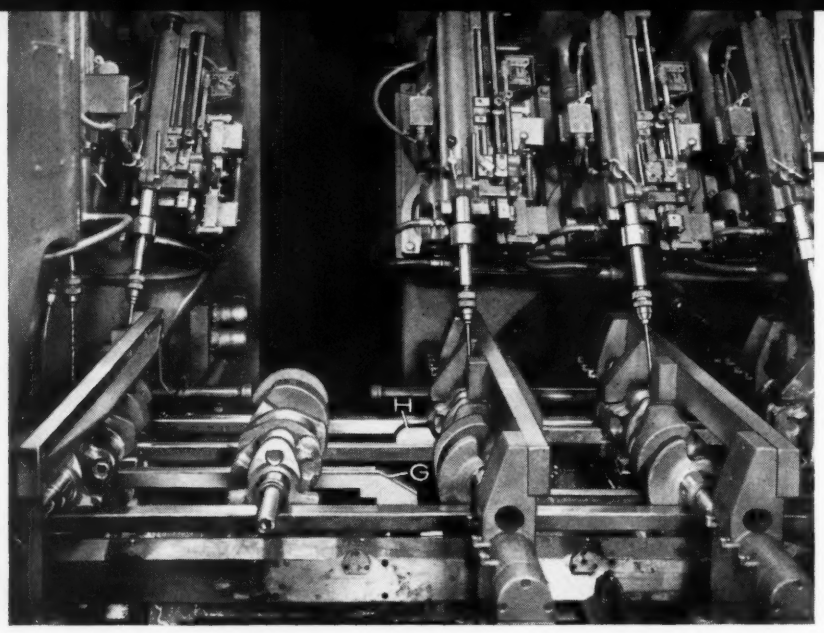


Fig. 3. Close-up View of Transfer Machine, Showing the Means Provided for Rotating the Crankshaft through an Angle of 90 Degrees

and the units returned to their starting positions, as indicated by colored lights on the master control station at the front of the machine.

The steps in the progressive drilling of the holes and the operations performed at each station are listed in the accompanying table. An outstanding design feature of the machine is the method by which the crankshafts are rotated axially through an angle of 90 degrees when they are moved from stations 6 to 7, 13 to 14, 19 to 20, and 26 to 27. This rotation brings the angular holes into accessible drilling positions and accurately aligns them with the drilling spindles.

A section of the transfer mechanism is shown in Fig. 2. The long shuttle bar *A* is advanced by means of a hydraulic cylinder, (not shown). This cylinder is directly connected to the center plate *D*, and is mounted on brackets near the center of the machine. The friction between shuttle bar *A* and plate *D*, which is provided with a series of bronze disks *B* that serve as wear shoes, retards the movement of the shuttle bar momentarily, until fingers *C* have been raised to the position shown. The amount of motion between the shuttle bar and plate is limited by pin *K*, which is secured in the shuttle bar, coming in contact with the ends of elongated slots in the plate. When the pin reaches the end of the slot, both shuttle and plate are advanced the required amount.

The fingers are raised by rack teeth cut in the top surface of center plate *D*, which engage pinion teeth in the under side of shaft *E*. The angle to which the fingers are elevated is determined by the length of the slot in the plate. The raised fingers come in contact with crankshafts *F* and slide them along rails *G* as the whole assembly moves over rollers *R*. When the pressure in the hydraulic cylinder is reversed, the crankshafts are picked off the rails by centers *J* and the parts of the transfer mechanism are returned to their original position.

The relative transverse location of the rails on which the crankshafts travel is such that the crankshafts are rotated axially at certain points, as illustrated in Figs. 3 and 4. Some of the

(Concluded on page 158)

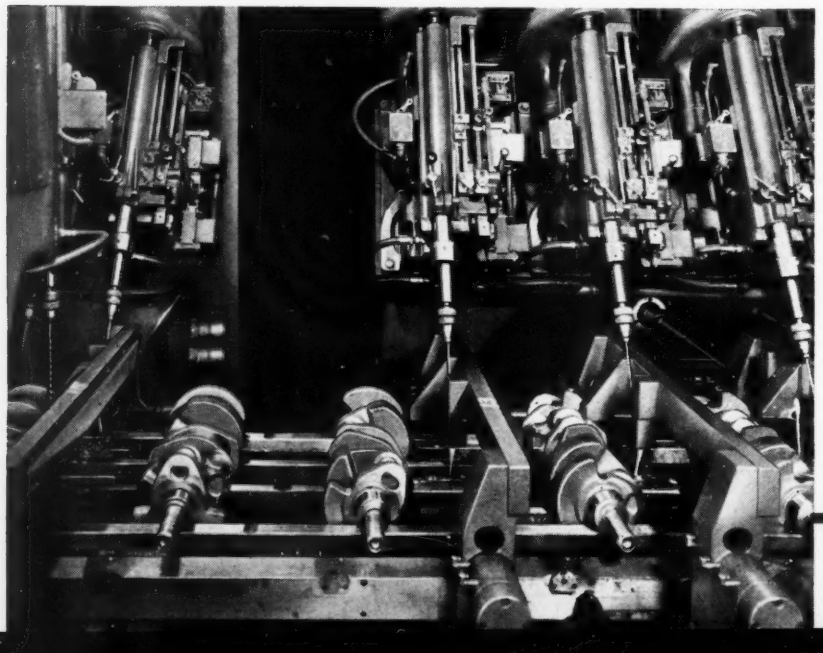


Fig. 4. In This View, the Second Crankshaft from the Left is in the Process of being Indexed through 90 Degrees, while the Shaft at the Far Left has been Rotated into Position for Drilling at the Next Station

A Liberal Democratic Government is Worth Working For!

IN an open letter which the president of the International Association of Machinists recently addressed to all members of his union, he made the startling statement, "I believe that we have come to a time in our lives when each of us must make up his mind whether or not a liberal democratic government is worth working for." The letter is a plea for all I.A.M. members to work assiduously for the election of men to Congress who are friends of labor, and to contribute generously to their campaign funds.

No one can quarrel with the object of the letter, because every citizen has the inalienable right to vote for the men he thinks will strive for the greatest ultimate good of the nation. But we do challenge the wisdom and sincerity of anyone who hints that a liberal democratic government is not worth working for.

How can anyone seriously raise such a question when it is considered that, although the United States has only 6 per cent of the world's area and only 7 per cent of its people, it has 60 per cent of all telephones, 80 per cent of all automobiles, and 35 per cent of the world's railroads; produces 70 per cent of the world's oil, 60 per cent of the wheat and cotton, 50 per cent of the copper and pig iron, 40 per cent of the coal and lead; and has $11,000,000,000 in gold, and two-thirds of the world's banking resources. The purchasing power of its people is greater than that of all the people of Europe or of Asia.

A prominent British publication recently expressed amazement that despite such a record of achievement, there could be some people in the United States who claim that our free enterprise system is "all wrong, ought to be abandoned, must be discouraged, and that the time has come to substitute political management for individual initiative and supervision." Nowhere in the world do people enjoy anywhere nearly as many material comforts as in the liberal democratic United States, not to mention our political and religious freedoms, and other advantages.

Criticisms of our form of government have usually come from foreign sources, but it is becoming increasingly necessary to defend it against criticisms made by people who are enjoying its benefits. Special interests, whether business, labor, agricultural, etc., are too prone to find fault with our form of government when they are really dissatisfied because they are not getting special considerations from their representatives in the legislative bodies. They forget the fact that the Government is by the people for all the people.

No, the time has not come to question whether a liberal democratic government is worth working for. Rather, the time has come to urge every citizen to loyally support all men who are honestly working for the continuance of the American form of government. Our national administration and Congress can and should be voted out of office if they fail to meet the people's approval—but our form of government has proved to be the best that has been developed in the history of civilization.

Charles O. Herb

EDITOR

Deep-Drilling of Crankshafts on Transfer Type Machines

(Continued from page 156)

crankpins of the shafts slide on the rails, while others are unsupported. When a crankpin that is suspended below the level of the rails comes in contact with the inclined nose of rail *G*, Fig. 3, the shaft is rolled through an angle of 90 degrees. At this point, the crankshaft comes to the end of rail *H*, and another crankpin rolls below the level of the rails. The second crankshaft from the left in Fig. 4 is in the process of being rolled over, while the one at the far left has been rolled over, and is ready to be drilled at the next station.

Forty-two hydraulic cylinders are employed to actuate the crankshaft clamping centers at the twenty-one machining stations. Hydraulic pressure is supplied to all these cylinders from one accumulator having a 5-H.P. motor-driven pump. Four other similar-sized accumulators are employed on the Krueger machines to supply the hydraulic drilling units.

With this method of progressive step-drilling, the deep holes are drilled only about one-fourth of the total depth at any one station. The maximum depth drilled at a station is about 1 1/16 inches. Twist drill wear is thus reduced to a minimum. High-speed steel twist drills with a heavy web, are employed throughout the machine. All of the 3/16-inch diameter drills are rotated at 800 R.P.M. and the 1/4-inch drills at 610 R.P.M. Larger diameter drills and reamers are revolved at the speeds shown in the table.

Each machine requires a floor space of only 18 feet wide by about 40 feet long—a substantial reduction over the area needed for a comparable number of conventional crankshaft drilling machines. Coolant is supplied from a central system, and chips are collected by a conveyor below the transfer mechanism, traveling the full length of the machine. Over five miles of wire are required to interconnect the numerous controls on each machine, exclusive of panels.

* * *

Westinghouse International Training Course

Westinghouse Electric International Co., Pittsburgh 30, Pa., has instituted a novel export program, one phase of which consists of training about 200 young Mexican and Chinese engineers in Westinghouse plants throughout the nation, so that they will be able to run the new electrical manufacturing plants now being established in those countries.

The Westinghouse organization, as a second step in its export program, is lending technical assistance in building and operating new electrical manufacturing plants in the countries mentioned. The same services are being extended by the company to countries where facilities are being expanded and plants destroyed by war are being reconstructed, including Holland, England, Italy, Belgium, Norway, and Australia.

* * *

According to *Automobile Facts*, the presidents of five of the nation's nine major car-making firms started in mechanical or engineering work. Three others rose from sales or office jobs.

© Bachrach

Roger B. Salinger, President of the Massachusetts Gear & Tool Co., Woburn, Mass., Who was Elected Treasurer of the American Gear Manufacturers Association at the Recent Annual Meeting

The Design of Dynamically Loaded Extension and Compression Springs

By CURT I. JOHNSON, Assistant Engineer
Engineering Department
International Business Machines Corporation
Endicott, N. Y.*

THE three basic equations for spring design, together with graphic representations of extension and compression springs and the symbols used in spring nomenclature, were given in the first installment of this article, which appeared in July MACHINERY, page 174. This article continues with tabular data and graphic representations designed to facilitate the solution of problems in compression and extension spring design.

Graphical Determination of Spring Index

The actual use of the equations for spring index C may be simplified considerably by plotting graphs of Y vs C. Fig. 9 is a Y vs C graph that has been prepared from Equations (10) and (13) for the design of music-wire springs. It is not necessary to plot a different set of Y vs C curves for compression springs, because solving for Y in Equations (10) and (13) gives for extension springs:

$$Y = \frac{GK}{\pi C^2 S_s} + (1 - T)$$

and for compression springs:

$$Y = \frac{GK}{\pi C^2 S_s} + T_c$$

Therefore, $(1 - T)$ and T_c are increments to Y that can be taken into consideration when reading the graphs in the form of additions to cr subtractions from Y and it is necessary only to plot C vs Y as determined from the equation

$$Y = \frac{GK}{\pi C^2 S_s}$$

The graph Fig. 9 was calculated with $G = 11{,}500{,}000$, and $S_s = 70{,}000$ for Curve No. 1, 85,000 for Curve No. 2, and 100,000 for Curve No. 3. In using this graph to determine C, Y is calculated from Equation (6), and the T factor is added or the T_c factor subtracted from Y to obtain the correct spring index C. This graph is very flexible in that the corresponding spring index for any value of T or T_c can be obtained from a single curve.

Spring Proportion Tables

The design of helical extension and compression springs can be simplified to a considerable extent by the use of properly prepared reference tables. In addition, if these tables are arranged so that they can be used in conjunction with a mathematical or graphical design procedure, as outlined in this article, springs can be designed to meet very exacting requirements with a minimum expenditure of time.

Partly because the spring index C has such a great significance in spring calculations and partly because it produces a desirable range of outside diameters for springs, arbitrary values of C in steps of 0.2 are used in the calculation of the spring proportion table shown in Fig. 10. This is one of a set of twenty similar tables, each giving sixty values for spring index C ranging from 3.00 to 14.8 by increments of 0.2. These twenty tables cover fifty-nine wire diameters d ranging from 0.004 to 0.170 inch. The computations required in preparing these tables were made with exceptional accuracy on International Business Machines punch-card computing machines at the Watson Scientific Computing Laboratory. For convenience, the outside diameter OD is listed in preference to the mean diameter D. The loads and deflections are calculated from the basic formulas at 100,000 pounds per square inch stress, making it easy to select springs for other stresses by direct proportion.

To use the tables, it is convenient to calculate Y from Equation (6) and then determine either C or Q graphically or from the formulas given. After C or Q has been found, the table may be

*Paper presented at the 1948 semi-annual meeting of the American Society of Mechanical Engineers in Milwaukee, Wis. This is the second of two articles, the first installment having appeared in July MACHINERY.

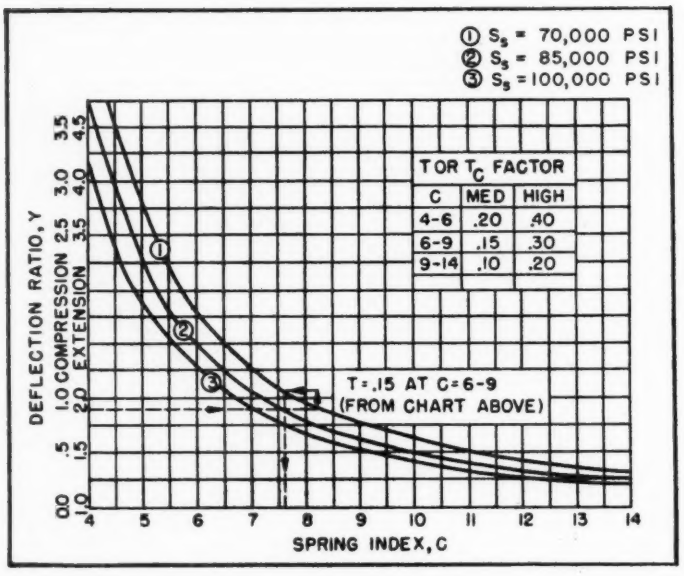


Fig. 9. Graph Developed for Use in Selecting Spring Indexes

scanned for the desired load P_T at the established C or Q value.

The formula for calculating the load values P_T is:

$$P_T = \frac{100{,}000\ P}{S_s}$$

where P is the maximum operating load and S_s is the desired maximum stress.

From the table, values may now be read for wire diameter d, outside diameter OD, and deflection f_T at table load P_T. The number of active coils may be calculated from the equation:

$$n = \frac{P_T \times s}{f_T\ (P - P_1)} \qquad (22)$$

where s is the operating stroke and P_1 is the minimum operating load. The solid active length L_o may be determined from the formula:

$$L_o = nd$$

to which should be added the necessary inactive coils and end loops to get the final specifications for the spring.

If the operating load and length conditions of a problem are drawn to scale and represented in the manner indicated in the diagram Fig. 4, (shown in the first installment of this article) Q may be scaled from a tentative initial tension point, and a coil of sufficient strength P_T and corresponding Q value selected from the spring proportion table, Fig. 10. If the Q value is not exact, this may be remedied by changing the initial tension accordingly. After the initial tension is fixed, the solid length L_o may be scaled, and the number of coils determined from the formula,

$$n = \frac{L_o}{d}$$

In the case of compression springs, as shown in Fig. 8 of the first installment of this article, L_o is measured at the final Q value. Care should be taken in making graphical solutions to insure that the coil clearance and initial tension will be sufficient to come within the recommended ranges.

The graphical solution of spring problems is explained further and in greater detail subsequently, in the section on the graphical cataloguing of existing springs, where Q is utilized in conjunction with the catalogue for making specifications for new springs from coil proportions of catalogued springs.

Space Considerations in Machine Designs Requiring Springs

In order to introduce well designed springs in a mechanism, it is of primary importance to have sufficient space available to accommodate a spring of the proper physical proportions. For a statically loaded spring, this is not nearly as important as for a spring subject to dynamic loadings; on the other hand, if the spring has to meet specific requirements with respect to its rate, the possible number of solutions to the problem is reduced. For this reason, a guide for making spring space allowances in the early phases of a design is a welcome aid to the designer. The spring tables will serve the purpose of establishing the required outside diameter clearance for a spring with an appropriate spring index if the approximate maximum working load has been defined.

It is quite another problem to determine the proper ratio between the active operating length L at load P and the working stroke s. This may be done by substituting the load increase factor $i = \frac{P}{P_1}$ in Equation (6) after expressing the spring rate R in terms of loads and stroke.

$$Y = \frac{LR}{P} = \frac{L\ (P - P_1)}{Ps}$$

$$Y = \frac{i - 1}{i} \times \frac{L}{s} \qquad (23)$$

By solving Equation (23) for the stroke-to-

Spring Index C	WIRE DIAMETER (d) = .085				WIRE DIAMETER (d) = .090				WIRE DIAMETER (d) = .095			
	Outside Diameter O. D.	Load P_T	Deflection Per Coil f_T	Load Constant Q_T	Outside Diameter O. D.	Load P_T	Deflection Per Coil f_T	Load Constant Q_T	Outside Diameter O. D.	Load P_T	Deflection Per Coil f_T	Load Constant Q_T
3.0	.340	60.980	.0132	393.569	.360	68.365	.0139	441.233	.380	76.172	.0147	491.620
3.2	.357	58.851	.0155	323.324	.378	65.978	.0164	362.481	.399	73.513	.0173	403.875
3.4	.374	56.815	.0180	268.903	.396	63.696	.0190	301.469	.418	70.969	.0201	335.896
3.6	.391	54.877	.0206	226.076	.414	61.523	.0218	253.455	.437	68.549	.0231	282.399
3.8	.408	53.038	.0235	191.904	.432	59.461	.0249	215.145	.456	66.251	.0263	239.713
4.0	.425	51.295	.0265	164.301	.450	57.507	.0281	184.199	.475	64.074	.0297	205.234
4.2	.442	49.646	.0298	141.758	.468	55.658	.0315	158.926	.494	62.014	.0333	177.075
4.4	.459	48.085	.0332	123.165	.486	53.908	.0351	138.082	.513	60.064	.0371	153.850
4.6	.476	46.608	.0368	107.692	.504	52.253	.0390	120.734	.532	58.220	.0411	134.522
4.8	.493	45.210	.0406	94.710	.522	50.685	.0430	106.180	.551	56.474	.0453	118.305
5.0	.510	43.886	.0445	83.736	.540	49.201	.0472	93.877	.570	54.820	.0498	104.597
5.2	.527	42.632	.0487	74.396	.558	47.795	.0516	83.405	.589	53.253	.0544	92.930
5.4	.544	41.442	.0531	66.396	.576	46.461	.0562	74.437	.608	51.767	.0593	82.938
5.6	.561	40.313	.0576	59.505	.594	45.195	.0610	66.711	.627	50.356	.0644	74.330
5.8	.578	39.240	.0623	53.536	.612	43.992	.0660	60.020	.646	49.016	.0696	66.874
6.0	.595	38.219	.0672	48.340	.630	42.848	.0712	54.195	.665	47.741	.0751	60.384
6.2	.612	37.248	.0723	43.797	.648	41.759	.0765	49.101	.684	46.528	.0808	54.708
6.4	.629	36.323	.0776	39.805	.666	40.722	.0821	44.626	.703	45.373	.0867	49.722
6.6	.646	35.441	.0830	36.285	.684	39.733	.0879	40.679	.722	44.271	.0928	45.324
6.8	.663	34.599	.0887	33.168	.702	38.790	.0939	37.185	.741	43.219	.0991	41.431
7.0	.680	33.795	.0945	30.398	.720	37.888	.1001	34.079	.760	42.215	.1056	37.971
7.2	.697	33.027	.1005	27.928	.738	37.026	.1064	31.311	.779	41.255	.1123	34.886
7.4	.714	32.291	.1067	25.719	.756	36.202	.1130	28.834	.798	40.336	.1193	32.127
7.6	.731	31.587	.1131	23.738	.774	35.412	.1198	26.612	.817	39.456	.1264	29.651
7.8	.748	30.912	.1197	21.954	.792	34.655	.1267	24.613	.836	38.613	.1338	27.424
8.0	.765	30.264	.1264	20.345	.810	33.929	.1339	22.809	.855	37.804	.1413	25.414
8.2	.782	29.642	.1334	18.890	.828	33.232	.1412	21.178	.874	37.027	.1491	23.596
8.4	.799	29.045	.1405	17.570	.846	32.563	.1488	19.698	.893	36.282	.1570	21.948
8.6	.816	28.471	.1478	16.371	.864	31.920	.1565	18.353	.912	35.565	.1652	20.449
8.8	.833	27.919	.1553	15.278	.882	31.301	.1645	17.128	.931	34.875	.1736	19.084
9.0	.850	27.388	.1630	14.280	.900	30.705	.1726	16.010	.950	34.211	.1822	17.838
9.2	.867	26.876	.1709	13.368	.918	30.131	.1809	14.987	.969	33.571	.1910	16.698
9.4	.884	26.382	.1790	12.531	.936	29.577	.1895	14.049	.988	32.955	.2000	15.653
9.6	.901	25.906	.1872	11.763	.954	29.044	.1982	13.188	1.007	32.360	.2092	14.694
9.8	.918	25.447	.1956	11.057	.972	28.529	.2071	12.396	1.026	31.787	.2186	13.811
10.0	.935	25.003	.2042	10.406	.990	28.031	.2163	11.666	1.045	31.233	.2283	12.998
10.2	.952	24.575	.2130	9.805	1.008	27.551	.2256	10.992	1.064	30.697	.2381	12.247
10.4	.969	24.160	.2220	9.249	1.026	27.086	.2351	10.369	1.083	30.180	.2482	11.554
10.6	.986	23.760	.2312	8.735	1.044	26.637	.2448	9.793	1.102	29.679	.2584	10.911
10.8	1.003	23.372	.2406	8.258	1.062	26.202	.2547	9.258	1 121	29.195	.2689	10.315
11.0	1.020	22.996	.2501	7.815	1.080	25.781	.2648	8.762	1.140	28.726	.2795	9.762
11.2	1.037	22.633	.2598	7.404	1.098	25.374	.2751	8.300	1.159	28.271	.2904	9.248
11.4	1.054	22.280	.2698	7.020	1.116	24.978	.2856	7.871	1.178	27.831	.3015	8.769
11.6	1.071	21.938	.2799	6.663	1.134	24.595	.2963	7.470	1.197	27.404	.3128	8.323
11.8	1.088	21.607	.2901	6.330	1.152	24.223	.3072	7.096	1.216	26.990	.3243	7.907
12.0	1.105	21.285	.3006	6.018	1.170	23.863	.3183	6.747	1.235	26.588	.3360	7.518
12.2	1.122	20.973	.3113	5.727	1.188	23.512	.3296	6.420	1.254	26.198	.3479	7.154
12.4	1.139	20.669	.3221	5.454	1.206	23.172	.3411	6.115	1.273	25.818	.3600	6.813
12.6	1.156	20.374	.3332	5.198	1.224	22.842	.3528	5.828	1.292	25.450	.3724	6.493
12.8	1.173	20.088	.3444	4.958	1.242	22.520	.3646	5.559	1.311	25.092	.3849	6.193
13.0	1.190	19.809	.3558	4.733	1.260	22.208	.3767	5.306	1.330	24.744	.3976	5.912
13.2	1.207	19.538	.3674	4.521	1.278	21.904	.3890	5.068	1.349	24.405	.4106	5.647
13.4	1.224	19.274	.3791	4.321	1.296	21.608	.4014	4.844	1.368	24.075	.4237	5.398
13.6	1.241	19.017	.3911	4.133	1.314	21.320	.4141	4.634	1.387	23.755	.4371	5.163
13.8	1.258	18.767	.4032	3.956	1.332	21.039	.4270	4.435	1.406	23.442	.4507	4.941
14.0	1.275	18.523	.4156	3.789	1.350	20.766	.4400	4.247	1.425	23.138	.4645	4.732
14.2	1.292	18.285	.4281	3.631	1.368	20.500	.4533	4.070	1.444	22.841	.4785	4.535
14.4	1.309	18.054	.4408	3.481	1.386	20.240	.4667	3.903	1.463	22.552	.4926	4.349
14.6	1.326	17.828	.4537	3.340	1.404	19.987	.4804	3.745	1.482	22.270	.5071	4.172
14.8	1.343	17.608	.4668	3.207	1.422	19.740	.4942	3.595	1.501	21.994	.5217	4.005

Fig. 10. One of Twenty Tables Prepared for Use in Designing Helical Music-wire Springs

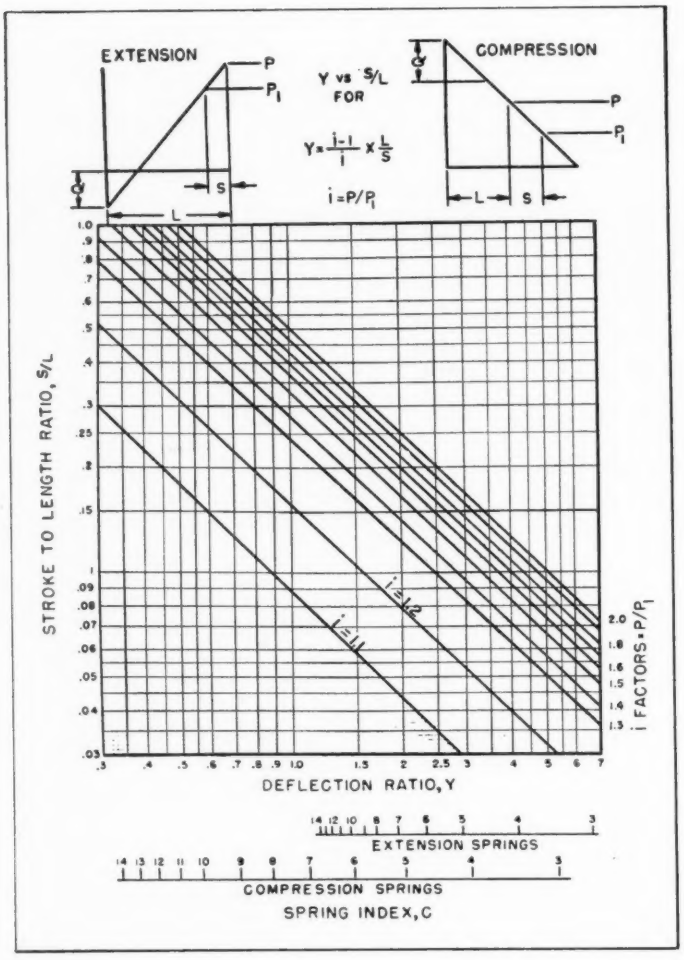


Fig. 11. Graph for Selecting Stroke-to-length Ratio and Maximum-to-minimum Working Load Ratio for Springs

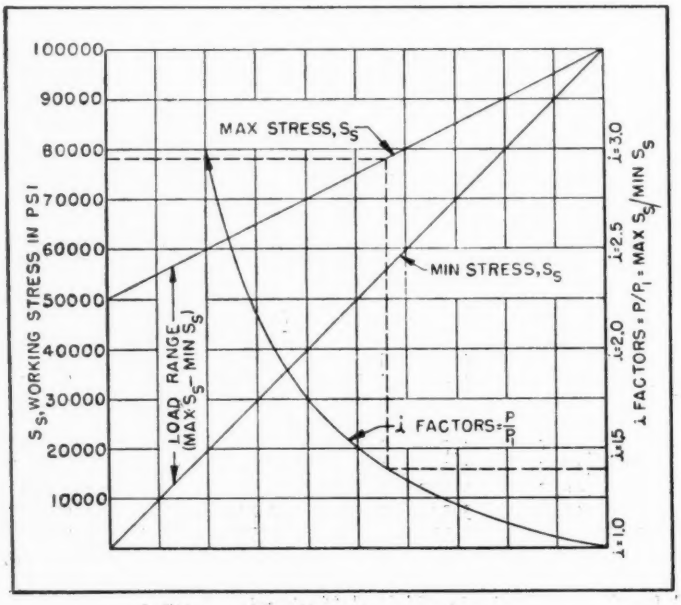


Fig. 12. Diagram Used in Determining Working Stress of Springs

length ratio $\frac{s}{L}$ at various values of Y and i, the graph in Fig. 11 is produced. This graph may be used for selecting $\frac{s}{L}$ and $\frac{P}{P_1}$ values that will produce a spring with reasonable proportions. Since a spring index between 6 and 9 falls within what may be considered an optimum range, it will be well to select Y values which will eventually produce a spring whose index will fall within that range. It should be noted that Equation (23) does not include a load term P. This is a valuable asset in that it is possible to determine suitable spring proportions without knowing the final load requirements in the mechanisms.

$$L = \frac{Yis}{i - 1} \qquad (24)$$

Selecting Working Stress

The load increase factor $i = \frac{P}{P_1}$ takes on added significance when its use in conjunction with fatigue tests is considered. Fig. 12 is a diagram showing the trend of results from fatigue tests of springs operating over various loading ranges. Failure in actual tests takes place at points above the maximum stress shown, but on the same general curve. The maximum stress has been modified to allow an adequate safety factor. Inasmuch as the torsional stress in the spring will be proportional to the applied load,

$$\frac{\text{maximum stress}}{\text{minimum stress}} = \frac{P}{P_1} = i$$

a curve plotted with respect to maximum S_s vs i may be superimposed on the fatigue diagram and used to determine the safe maximum design stresses for various load increase factors.

Inactive Length Allowance

The L term in the stroke-to-length ratio and in Formulas (6) and (23) for calculating Y represents the active working length at maximum load P. When determining length requirements between supports early in the design of a mechanism from Y or $\frac{s}{L}$,

it is necessary to add to the active working length the approximate inactive length to avoid the necessity for severe requirements with respect to initial tension or coil clearance in the final design. Also, for the same reason, when calculating Y for a spring that is to operate between two previously located supports, it is necessary to subtract the approximate inactive length. Fig. 13 may be used as a guide in selecting the approximate inactive length allowance when the maximum load is predictable. Curve 1 is for extension springs with regular machine end loops. Curves 2, 3, and 4 are for compression springs with squared, squared and ground, and plain ends, respectively. The actual inactive length will be calculated from the accepted formulas when the coil proportions are known.

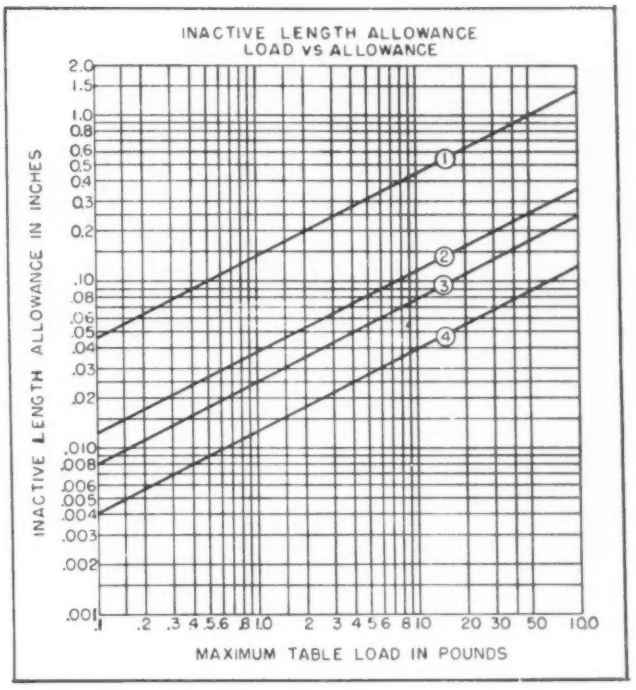


Fig. 13. Diagram Used as Guide in Selecting Approximate Inactive Length Allowance for Spring when the Maximum Load is Predictable

Cataloguing of Existing Springs

Manufacturers who use considerable numbers of extension and compression springs in their products are faced from time to time with the problem of selecting existing springs for changes in the machine design or for new applications. Unless sufficient data are available, it is generally easier for the designer to specify a new spring than to use one that is already released for production. Consequently, new springs are often duplications of existing designs. From the standpoint of economy and speed in procurement, it is desirable to be able to select a stock spring for the new application. In order to facilitate such selection, it is possible to use the information presented in this article for producing a spring catalogue that will accurately reflect the spring specifications and make it easy for the designer to select a spring with the desired characteristics. Furthermore, with the method of cataloguing springs described in the following paragraphs, it is possible to use available spring data to set up specifications for new springs in case a suitable spring is not available.

Fig. 14 indicates the method used for plotting the gradients for various springs. It should be noted that the spring gradient starts at a distance L_i from the Y — Y axis. This distance represents the inactive coils and end loops of the spring. The inclusion of L_i makes it possible to consider the spring characteristics on the basis of the over-all dimensions of the spring rather than the active coils alone. In the illustration Fig. 14, showing a spring gradient, the upper end of the solid line represents

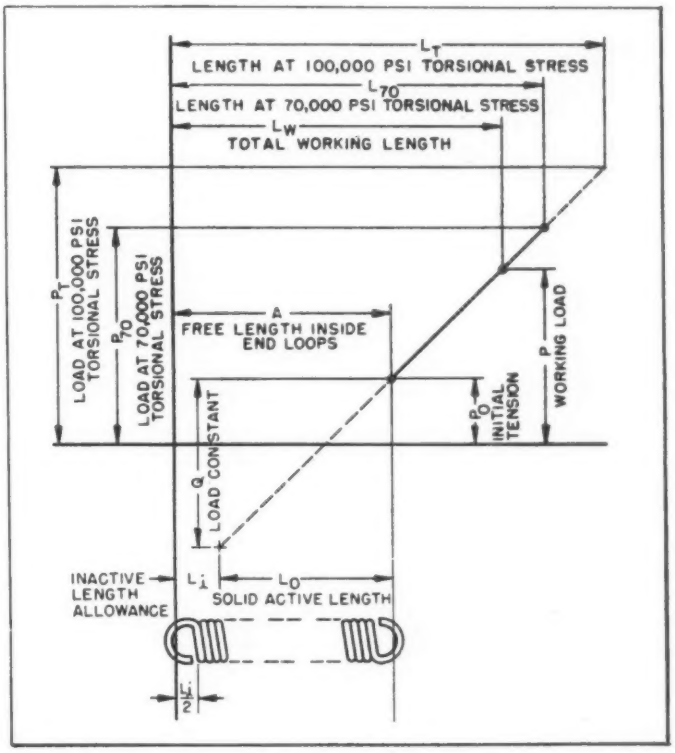


Fig. 14. Diagram Used for Plotting the Gradients for Various Springs

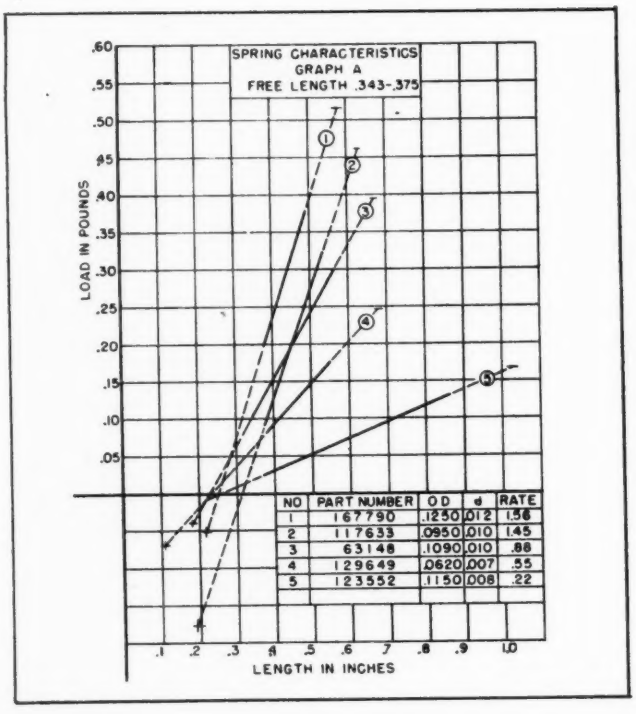


Fig. 15. Chart for Selecting Spring that will Have Desired Load at a Definite Extension. The Stress at which the Spring is Working under Those Conditions can also be Determined from the Chart

the load that produces 70,000 pounds stress, and the upper end of the broken line represents the load producing 100,000 pounds torsional stress.

An actual chart of a family of gradients is shown in Fig. 15. The graphs represent springs, all of which have essentially the same free length. It is easily seen how conveniently a designer can select a spring that will give him the desired load at a definite extension, and also determine the stress at which the spring is working under those conditions. This work is made much easier if the graphs are supplemented by a display panel showing springs actually made to specifications for previous jobs and which are available for use in new designs.

The spring catalogue is also useful in establishing specifications for new springs when springs cannot be found that will meet the requirements. An example of this is shown in Fig. 16, in which is depicted a required spring whose gradient should go to point *B* in the coordinate system. If an outside diameter of 0.375 inch will be satisfactory, a line is drawn through points *B* and *C*, since *C* is the terminal point for the gradient of a spring with a 0.375 inch diameter. The line *FD*, representing the initial tension of spring No. 2, is extended to the new gradient at *E*. The new free-length inside end loop is equal to the distance *FE* and the rate equals the slope of the gradient. The specifications for the wire diameter and outside coil diameter were taken from the tabulated data on the graph for spring No. 2.

Similarly, it is possible to obtain the specifications for a spring which must have a definite rate. In this case, it will be necessary to plot two points in the coordinate system and draw a line between them, extending the line and selecting a point *C* that lies close to the gradient drawn. The specifications can now be obtained as in the previous example. The procedures just described are further applications of the load-constant principle, and are similar to the graphical solution described in connection with the spring proportion tables.

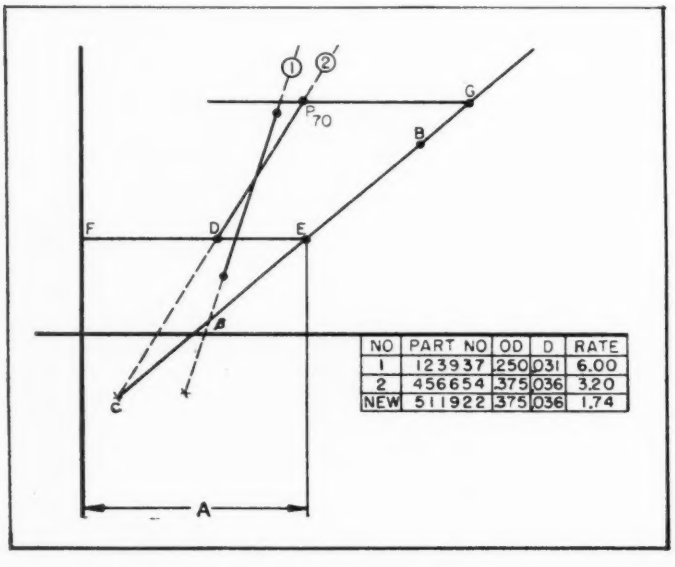


Fig. 16. Diagram Used in Establishing Specifications for a New Spring

* * *

University of Iowa Offers Quality Control Course

To meet requests by executives in industry for another training program in quality control by statistical methods, the State University of Iowa announces a short, intensive course in this subject, to be given October 5 to 15. This is the sixth quality-control course offered by the university. The course is designed for persons holding supervisory positions, where the knowledge gained can be applied immediately. Details can be obtained by writing to Professor Lloyd A. Knowler, Department of Mathematics, University of Iowa, Iowa City, Iowa.

Comparator-Chart Inspection of Tapered Pipe-Thread Gages

The Use of Comparator Charts to Check Pitch Diameter, Gaging Notch Diameter, Taper, Angles, and Form of Pipe-Thread Production Gages has Simplified Control Procedures and Saved Inspection Time

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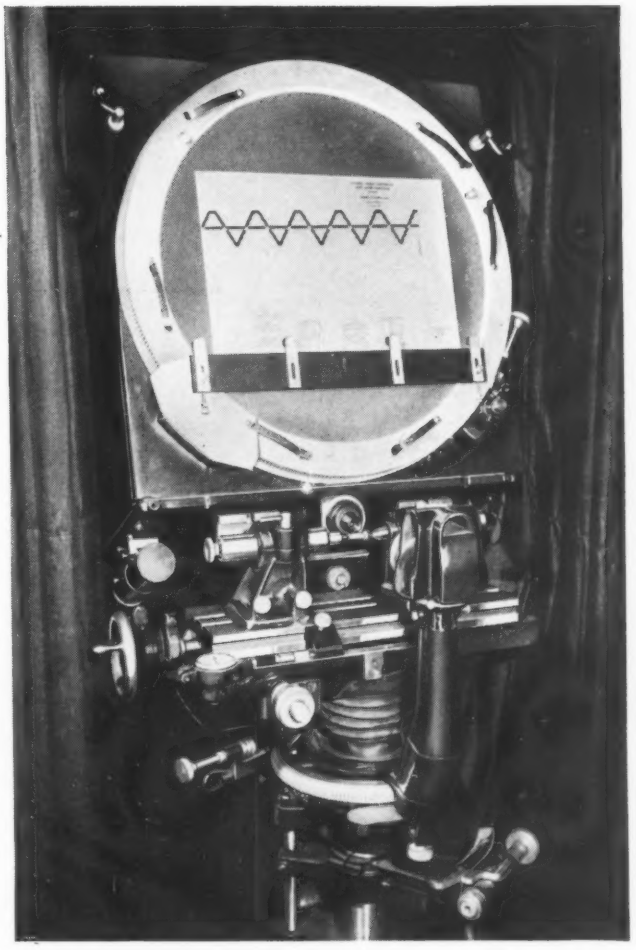


THE inspection of production gages used to check tapered pipe threads is difficult and time-consuming when performed in the usual manner. It involves first checking the taper, angles, and form on an optical comparator, and then measuring pitch and gaging notch or step diameters by the over-wire method.

Of these procedures, the determination of diameter dimensions is most subject to error because of the care with which the wires must be positioned and the necessity of making mathematical calculations. Consequently, the Lockheed Aircraft Corporation, which makes extensive use of tapered pipe threads made to National pipe thread standards, has eliminated this step entirely, and now makes all inspections, including the checking of diameters and tolerances, on an optical comparator.

This is accomplished by the use of "chart-gages," developed by the Engineers Specialty Division for use on a Jones & Lamson measuring type comparator such as shown in the heading illustration. These charts are designed to provide all contours and check points necessary for the inspection of each of the National pipe thread standard pitches, as outlined in Army-Navy Specification AN-GGG-P-363. Included on each chart are contours of the threads, pitch lines, tolerance limits, a vertical reference or location line, and all instructions and tabulated information necessary for its use.

The lower contour line is used for locating the production gage in the correct vertical position on the comparator and for inspecting the thread form, while the upper contour line (on which are indicated the tolerance limits) is used for measurements. The same thing applies to the upper and lower pitch lines, which also can be used to measure the taper and diameters of plain taper plug gages.

The use of these charts permits a complete inspection of the following gages: Taper thread plug gages (L_1 and L_3) used, respectively, to check the length of normal thread engagement and the length of the effective thread, as well as the diameters in each case at the gaging notch; plain taper plug gages (C) used to check internal taper and diameters; external taper set plug gages (G), used to check external diameter and taper; and thread setting plug gages (F), used to check basic pitch diameters.

Although the methods used to check these gages vary in detail, they are similar in principle. For example, consider the inspection of an L_3 taper thread plug gage, Fig. 1. First the gage is set up on centers on the staging table of

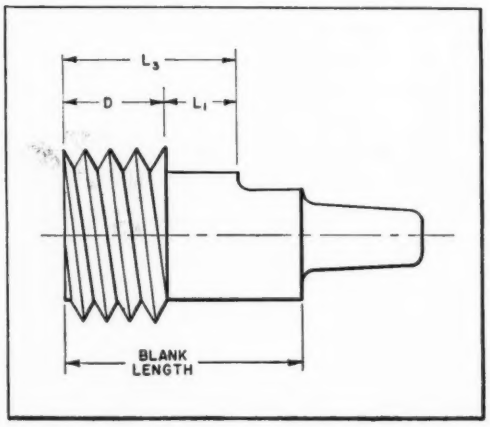


Fig. 1. Tapered Thread Plug Gage (L_3) Used to Check Production Parts for the Length of Effective Thread and the Diameter at the Gaging Notch

the comparator, as shown in Fig. 2, and the edge of the basic step or notch is lined up with the vertical reference line at the right of the chart. From this position, the gage is moved horizontally an amount equal to the distance L_1, Fig. 1. As can be seen in the drawing, this brings the basic pitch diameter (referred to as E_0 in the Army-Navy specifications) to the reference line. The gage is then in the correct lateral position for inspection.

Then by raising or lowering the gage with the handwheel on the comparator, the shadow of the threads is located on the lower contour line of the chart. In this position, shown in Fig. 3, the threads are visually checked for taper, form, and lead. Any deviation from the charts is readily noticeable, as the magnification is 50X. Actual measurements of variations can be made by moving the shadow until it lines up with the contour and noting the variation on the vernier protractor or the comparator micrometers.

After this inspection, the plug gage is lowered a distance equal to the pitch diameter E_0 at this location minus the distance between the two pitch lines on the chart. This should bring the shadow of the thread gage into coincidence with the upper contour line of the chart, as illustrated in Fig. 4. If the plug gage is within the required tolerance, light will show in small slits along the bridge type, "Go"—"No Go" light scale. This scale is a line with heavy black identifications that represent total tolerance. In this position, the shadow will reveal any deviations in the over-all contour of the gage. The measurements that are required to determine the extent a gage is out of tolerance can be made by use of the comparator micrometers, the distance required to bring the shadow to or away from a particular reference line being noted.

The only difference between inspection operations on the L_3 gage and the L_1 gage is that the latter is less difficult to set up, since locating the basic step or gaging notch on the reference line automatically brings the threads on the reference line; lateral movement is not necessary after this initial locating operation.

Plain taper six-step plug gages and plain taper setting plug gages are checked by using the pitch lines that are laid out on all charts. As with the

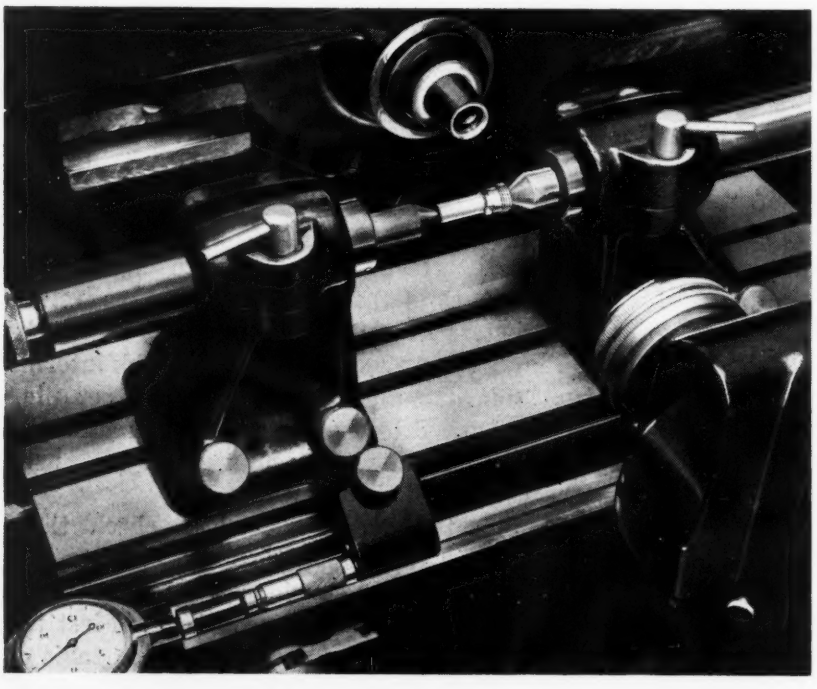


Fig. 2. An 18-pitch L_3 Plug Gage Set up on Centers on the Movable Table of the Comparator and Aligned for Projection. Light Source Can be Seen at Front and 50X Magnifying Lens at Back

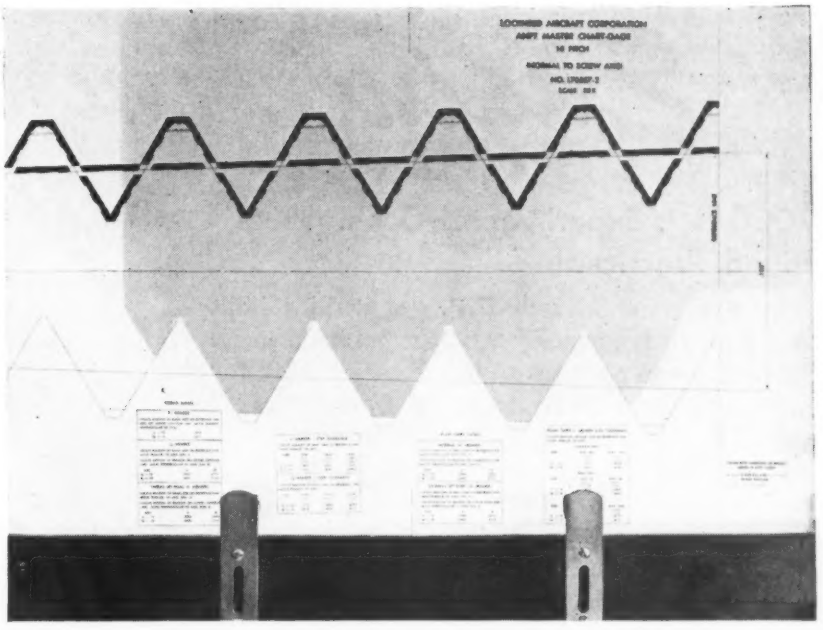


Fig. 3. After the Shadow of the Gaging Notch is Located on the Reference Line, the L_2 Gage is Moved First Horizontally a Distance Equal to L_1 (Fig. 1) and then Vertically until the Thread Shadow Lines up with the Lower Contour Line, as Shown, to Check the Taper, Form, and Lead

thread contours, the lower line is used for locating the shadow, after which the shadow is moved through the line an amount equal to the diameter at the reference step less the spacing on the chart. The shadow must come within the limits of the "Go"—"No Go" light scale on the upper pitch line. This scale has been so laid out that it shows the full gage tolerance for both taper and diameter.

Lateral measurements to check step distances are made by locating the shadow of the small end on the reference line and then using the table travel micrometer on the comparator. At the magnification ratio of 50 to 1, any measurements can be made by this method with the assurance of coming within a tolerance of 0.0002 inch. The glass chart-gages are guaranteed to have a dimensional tolerance of 0.0005 inch on the glass, which amounts to 0.00001 inch on the part or gage being inspected.

Several advantages have been realized by this system. Inspection of production gages has been speeded up. What was previously an exacting job by the wire method of measuring, requiring proper positioning and the use of super-micrometers, as well as mathematical calculations, has been made a matter of routine for the comparator operator.

At the Lockheed plant, this system has obviated the need for thirty-six reference ring gages and thirty-six master plug gages. Now, there is one chart-gage for each pitch rather than a reference ring gage and a master plug gage for each pipe thread size.

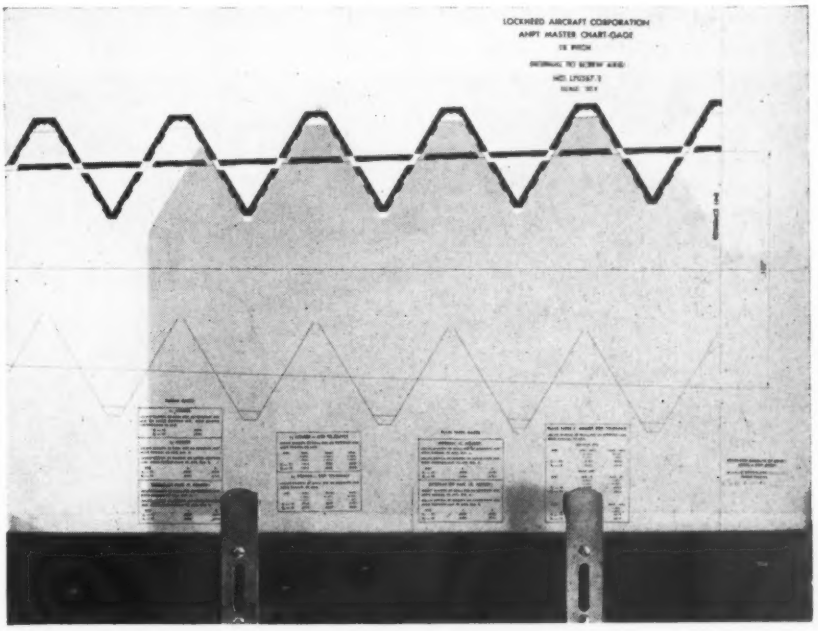


Fig. 4. A Check on Diameter is Made by Moving the Shadow through the Lower Contour Line a Specified Distance and Determining if the Tooth Shadows Fall within the Tolerance Limits Shown on the Upper Contour Line. Actual Measurements of Deviations are Made with the Vernier Protractor or Comparator Micrometers

Engineering News

2000-H.P. Experimental Gas Turbine Found Practicable

An experimental 2000-H.P. gas turbine built by the Westinghouse Electric Corporation in its South Philadelphia plant has been on test for approximately a year, totalling 1000 hours of operation. The results obtained from these tests indicate that this type of power plant should be successful both for general industrial and transportation use.

The unit, shown in the accompanying illustration, is very compact, lending itself to a narrow "in-line" arrangement, particularly suitable for locomotive service. It is 26 feet long, 6 feet high, and approximately 3 1/2 feet wide. Complete, it weighs 19 pounds per horsepower. It consists of two direct-current generators, suitable gears, an air intake, an axial flow compressor, multi-element combusters (the tubular structures in the center of the photograph), a gas turbine, and an exhaust.

The fuel rate at full load is 0.78 pound per B.H.P. per hour, which corresponds to a thermal efficiency of 16.7 per cent based on a fuel having a heat value of 19,500 B.T.U.'s per pound. The maximum output obtained with the unit has been 2220 H.P. when operating with an air inlet temperature of 48 degrees.

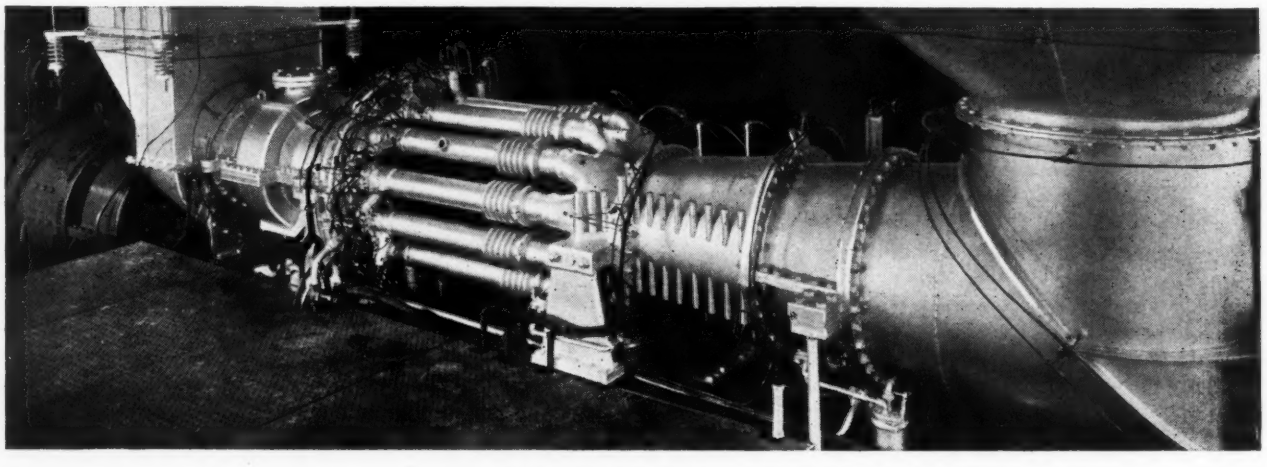
This type of power plant is easy to start and control, runs smoothly, and is not excessively noisy. Loading and unloading cycle tests, consisting of starting the unit from stand-still and rapidly changing from no load to full load, have proved its practicability for locomotive service. The tests also indicate that an open-cycle gas-turbine power plant using either fuel oil or gas can be made practical for power generation. Such a unit probably would have a fuel rate of about 0.6 pound per B.H.P. per hour.

Hydraulic Hose that withstands 3000 Pounds per Square Inch

On some of the newest large airplanes, a sudden surge of hydraulic power occurs in operating the landing gears, flaps, and other mechanical devices. For such applications, the B. F. Goodrich Co., Akron, Ohio, has developed a hose capable of withstanding pressures considerably in excess of the 3000 pounds per square inch required for this purpose. The steel wire used in the construction of this hose has a tensile strength of over 400,000 pounds per square inch.

Supersonic Reflectoscope for Testing Welds

Welds in ferrous and other metals can be inspected for lack of bond, inclusions, or voids by means of a new testing technique employing high-frequency sound waves generated by a supersonic reflectoscope. This new development, announced by Sperry Products, Inc., 1505 Willow Avenue, Hoboken, N. J., which is known



Operating Tests on This 2000-H.P. Gas Turbine, Built by the Westinghouse Electric Corporation, have Indicated the Practicability of This Type of Power Plant for Industrial and Transportation Use

as angle-beam transmission, makes possible the entrance of the sound beam into the welded part at an angle.

The searching unit, whose primary element is a quartz crystal, can be placed on the smooth parent metal adjacent to the weld, or even at some distance from it. The energy travels by successive reflections between the surfaces of the material until an interface is reached. The weld metal, itself, does not constitute a reflecting interface, but any voids or inclusions will reflect part of the sound beam back to the searching unit, where it is amplified to provide a vertical deflection of the horizontal tracing beam on an oscilloscope screen.

Searching Unit of Reflectoscope Employed in Detecting Flaws in Welds

A time marking system allows accurate calibration to determine the distance from the searching unit to the flaw, and it is thus possible to distinguish between defects in the plate and those in the weld area. It is claimed that smaller defects can be detected at greater depths with this new equipment than with other non-destructive testing equipment now in use. The sensitivity of the instrument can be controlled so that defects or voids too small to affect the efficiency of the weld will not be indicated. Since sound waves travel as well in aluminum and magnesium as in ferrous metals, welds in light metal plate and sheet stock can also be inspected. The depth of penetration in these metals is comparable to that in steel, and the same small-size defects can be located.

Why Power Failures Due to Lightning have Decreased

Improvements made in recent years in the design of electric power systems and their component parts—such as transformers, lightning arresters, and circuit-breakers—have reduced power failures from lightning to a small but still annoying number. These new developments have been made possible by the use of surge generators, which enable man to produce in the laboratory electrical surges having the same voltage and current magnitudes as those occurring on transmission lines as a result of natural lightning. Techniques in this field have advanced to the point where most manufacturers of high-voltage equipment now maintain high-voltage and high-current surge generators and measuring equipment in their laboratories, both for development testing of insulation designs and for routine tests on equipment for high-voltage networks.

Quick-Acting Liquid Wire-Stripper

Stripping of electrical wires is speeded up by the use of a liquid developed for removing wire insulating coatings. With this new product, it is merely necessary to dip the wire in the liquid and wipe off the coating with a rag or blow it off with compressed air. No tools, scraping, or special cleaning is required. The liquid is non-corrosive, non-inflammable, and will not harm fabrics, wood, or metal. This liquid stripper, called "Formula 21," is produced by Aircraft Marine Products, Inc., 1582 N. Fourth St., Harrisburg, Pa.

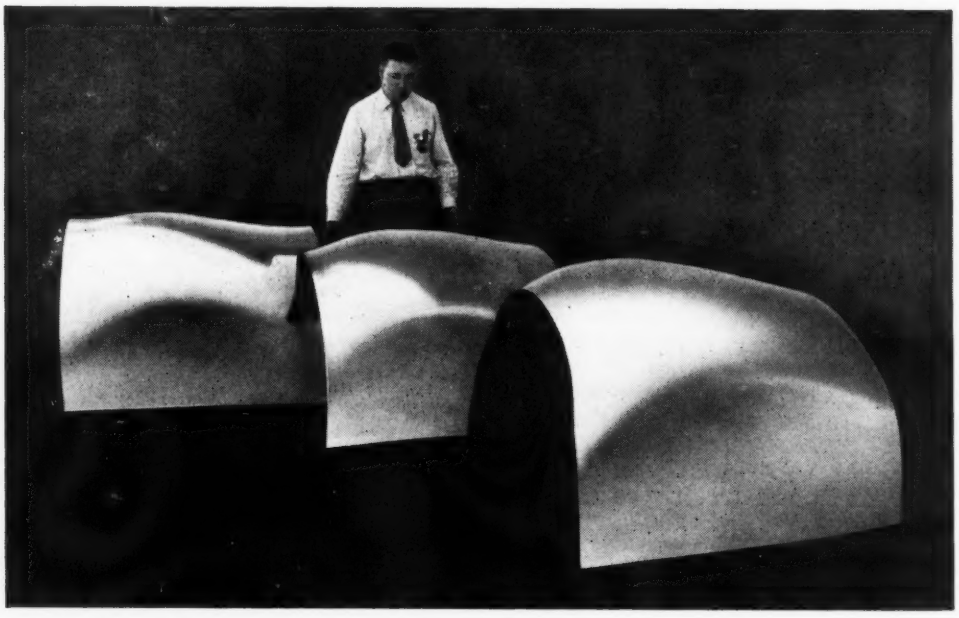
Device for Measuring Temperature of Turbine Combustion Gases

In gas turbines now being developed as power plants for land, sea, and air use, problems have arisen in the use of thermo-couples for indicating gas temperatures up to 2000 degrees F. These gases are normally much hotter than the surrounding walls, so that radiation from a thermocouple in the gas stream to the walls may cause an error in the observed values of gas temperatures.

At the request of the Bureau of Ships, United States Navy Department, physicists at the National Bureau of Standards, Washington, D. C., have undertaken the development of an effective shielding device. It was found that effective radiation shielding of the measuring junction can be accomplished by pressing a small tubular shield of silver, gold, or platinum directly on an oxidized junction of base metal. A paper presented at the semi-annual meeting of the American Society of Mechanical Engineers by Andrew I. Dahl and Ernest F. Fiock, of the Bureau of Standards, gave detailed results of service tests made with a blower supplying air to a single combustion chamber from a turbo-jet engine.

Hot Stretch-Forming of Aluminum Sheets

By J. A. JOHNSON



SECTIONS of an airplane fuselage skin are formed from sheets of various aluminum alloys, the alloy used depending on structural requirements, cost, ease of fabrication, and other factors. Because of their severely curved surfaces, these sections must often be broken down into a number of smaller pieces that are individually formed and then joined together by riveting or welding; or else they may be formed by a series of stretching operations, each followed by an appropriate heat-treatment. Obviously, such methods slow production and increase costs.

Hot-forming, when applied to appropriate types of aluminum-alloy sheets, shows promise of eliminating tears or fractures, even on sections with extreme curvatures, thus reducing the number of pieces required and the forming operations necessary, as well as the number of rejected parts. This process increases the elongation of 24S-O, 75S-O, and 75S-T alloys as indicated in Table 1. The higher values are obtained with dies heated to from 450 to 500 degrees F. for the annealed alloys and to 310 degrees F. for material in the S-T condition.

The dies used for hot-forming at the Lockheed plant are of the same material and finished in the same manner as those for cold-forming. Made of Kirksite, they are cast from plaster patterns and ground to a smooth finish. The die for a particular section is then mounted on the press with an insulating pad of Transite between it and the press platen, in order to prevent the platen from becoming overheated. (A pad 3/4 inch thick was sufficient for the dies used in forming the sections shown in Fig. 1.)

Table 1. Increases in Elongation of Aluminum Sheets Obtained by Hot-Forming

Material	Average Elongation, Per Cent*		Per Cent Increase	Maximum Elongation, Per Cent†		Per Cent Increase
	at Room Temp.	at Elevated Temp.		at Room Temp.	at Elevated Temp.	
24S-O	11.7	35.3 (450°F.)	202	14	52 (450°F.)	270
75S-O	9.3	29.3 (400°F.)	215	11	47 (450°F.)	327
75S-T	5.2	9 (300°F.)	73	6	17 (300°F.)	184

*Average of three measurements taken 20 inches apart.
†Localized elongation measured over 2-inch length.

In production, the die first contacts and heats the sheet at its crown. Since the yield stress is temporarily reduced in this heated area, the maximum strain in the material occurs at the crown of the die, progressive stretching occurring as the metal contacts the heated die surface. In this manner, the strain is automatically distributed over the most critical area. This represents the optimum strain distribution, and is in contrast to cold-stretching, where the maximum strain occurs close to the machine grippers.

As might be expected, a reduction in sheet thickness accompanies elongation. The amount of reduction, of course, depends on the elongation, as indicated in Table 2. These values, which were obtained by actual test, are in close agreement with those obtained by Poisson's ratio for metal in the plastic range; they are used as a guide in designing sections to be hot-formed, since the engineering design must allow for the reduction of metal thickness in proportion to the elongation of the material. (In addition, a minimum allowance equal to 12 1/2 per cent of the blank width was established by the shop for lateral contraction of the metal and finish trim.)

To obtain substantial increases in elongation, such as previously referred to, it is imperative to use an effective high-temperature lubricant, for when a poor lubricant is used, the maximum increases in elongation are reduced by approximately 50 per cent. Fels naphtha soap is a satisfactory lubricant for temperatures of 400 degrees F. and over. For temperatures under 400 degrees F., a combination of Fels naphtha soap (as a base) and grease has proved excellent. "Carbo-wax" 4000, made by the Carbide & Carbon Chemical Corporation, and Virgo 84A extreme-pressure oil, manufactured by the Shell Oil Co. also give good results.

Table 2. Reductions in Metal Thickness Due to Increased Elongation

Elongation (Per Cent)	30	40	50
Original Thickness (Inches)	0.040	0.040	0.040
Thickness after Forming (inches)	0.033	0.0317	0.030
Reduction (Inches)	0.007	0.0083	0.010
Reduction (Per Cent)	17.5	20.7	25

After being hot-formed, the annealed parts are heat-treated and cold-stretched to set the metal and eliminate distortion caused by quenching. Cleaning of the soap-lubricated parts prior to heat-treatment is done in a hot water bath, as a trichlorethylene solvent degreasing tank is ineffective. Stretching of the 24S "as quenched" skin to the final contour at room temperature creates considerable "orange peel" effect on the metal surface, whereas aging of the metal to the "T" temper before final stretching eliminates this effect. 75S-W aluminum stretch-forms to the final contour satisfactorily within one hour after solution heat-treatment. In no case is an elongation greater than 1.5 per cent necessary to eliminate warpage due to heat-treatment.

There is no impairment of physical properties of 24S-O or 75S-O alloys as a result of hot-forming at the indicated temperatures, nor does the process affect the corrosion resistance of these materials. As previously noted, 75S-T aluminum is formed at about 300 degrees F. to prevent impairment of the metal.

* * *

About 23,500 tons of palm oil were consumed by the steel industry in 1947. The two major uses of this oil are in the production of "hot-dipped" tin plate and cold-rolled sheet and strip.

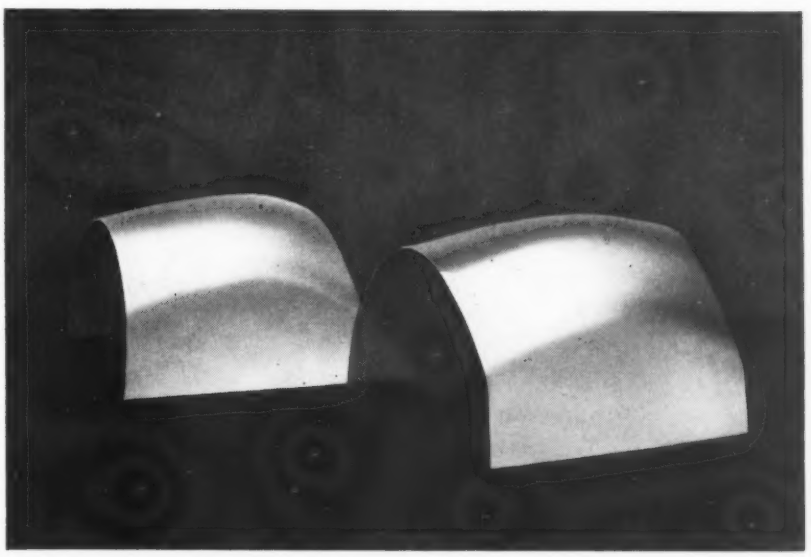


Fig. 1. The Skin Panels Shown Illustrate the Increases in Elongation that can be Obtained by Hot-Forming. Thus Hot-formed Aluminum can be Made into Panels with More Severely Curved Surfaces, as Shown at the Left

Performing Varied Use of a Single

Fig. 1. Milling a Keyway, 3/4 Inch Wide by 3/8 Inch Deep, in a Cold-rolled Steel Shaft with a Feed of 1 Inch per Minute

THE variety of operations that can be performed in a small machine shop can be increased by means of an attachment developed by the Versa-Mil Co., 30 Church St., New York 7, N. Y., for application to different types of machine tools. Mounted on the compound slide or carriage of a lathe, the attachment can be employed for milling, drilling, reaming, boring, and grinding operations. It is also applicable to other machine tools, such as planers, milling machines, boring mills, shapers, etc.

Parts normally requiring separate operations on several machine tools can be completed in one set-up by the use of this attachment, thus minimizing handling time. For example, after turning a cold-rolled steel shaft, 2 3/4 inches in diameter, in the lathe set-up shown in Fig. 1, a keyway, 3/4 inch wide by 3/8 inch deep, is milled in the shaft by means of the Versa-Mil attachment, as illustrated. A 3-inch diameter cutter, mounted on an arbor in the spindle of the attachment, is used for this operation. It is rotated at 98 R.P.M. and fed by means of the lathe carriage at the rate of 1 inch per minute.

The basic attachment, equipped with either a 1/2- or 3/4-H.P. motor, has thirteen standard spindle speeds ranging from 33 to 293 R.P.M. By substituting a milling and drilling head for the arbor, as shown in Fig. 2, nine spindle speeds ranging from 575 to 5125 R.P.M. are available. The mounting plate is calibrated to permit tilting the head to an angle of 30 degrees above or below center.

A dividing head having an expanding mandrel which fits into the rear end of the hollow spindle on the lathe is used to locate and maintain the angular relation and control the length of the two curved slots shown being milled in Fig. 2.

Fig. 2. Curved Slots can be Milled in the Face of a Part by Means of the Milling and Drilling Head Illustrated and a Dividing Head (Not Shown)

Operations by the Attachment

Radial location of the slots is obtained by positioning the cross-slide of the lathe.

The dividing head is also employed to index the work-piece when cutting spur gear teeth, as seen in Fig. 3. The gear blank is turned and faced, prior to cutting the teeth, in the same set-up. A reversing motor is employed on the attachment to permit changing the direction of rotation of the spindle. Interchangeable ground arbors enable a wide variety of cutting tools to be mounted in the spindle. The spindle housing can be adjusted vertically on the four hardened and ground guide posts through a range of 6 inches.

An external grinding attachment can be bolted to the spindle faceplate of the Versa-Mil for universal, cylindrical, surface, and tool grinding on lathes and other machine tools. Such a set-up on a lathe is shown in Fig. 4. The bore of a cast-iron part is shown being ground with a grinding wheel 4 inches in diameter by 1 1/4 inches wide. By changing the position of the lathe cross-slide, the periphery and one face of the part are ground with the same wheel and set-up. Large-diameter parts can be similarly ground by chucking the work on a vertical turret lathe. Six spindle speeds ranging from 4140 to 9475 R.P.M. are available, permitting efficient surface speeds for grinding wheels varying from 3 to 6 inches in diameter.

Fig. 3. Cutting Teeth in a Spur Gear Blank that has been Turned and Faced in the Same Lathe Set-up. The Blank is Indexed by a Dividing Head

An internal grinding attachment, similarly fastened to the faceplate of the Versa-Mil, has five spindle speeds ranging from 6050 to 13,800 R.P.M. The Versa-Mil is portable, and can be fastened to a bench. A feed table providing an 8-inch longitudinal travel and a 2-inch cross-feed is available to permit using the attachment on heavy or stationary work. A 90-degree head can be bolted to the faceplate of the attachment for milling threads, worms, or slots at any angle through 360 degrees.

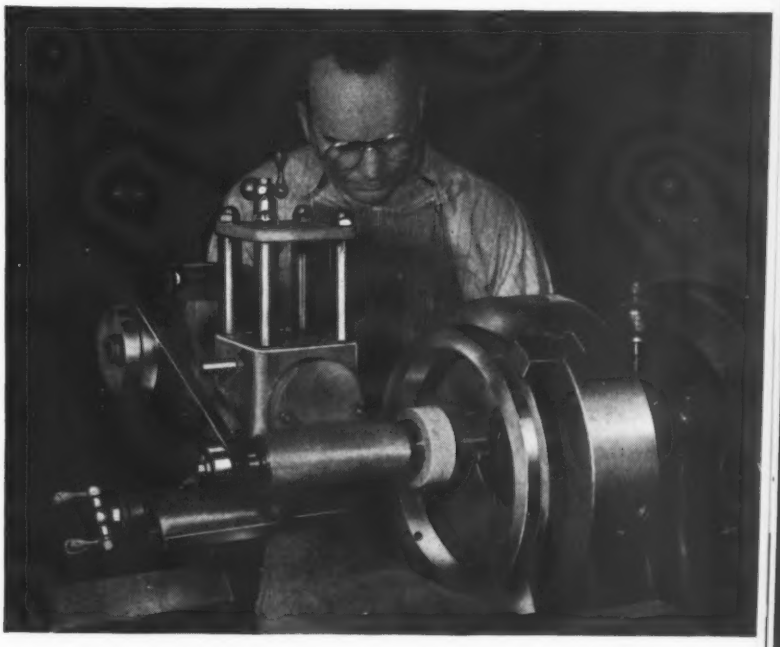


Fig. 4. The Bore, Periphery, and One Face of a Cast-iron Part are Ground by the Use of a Single Wheel in One Set-up, as Here Illustrated

Precision Investment Casting at Inco Bayonne Plant

Precision investment castings are being produced at the Bayonne, N. J., plant of the International Nickel Co. both by the pressure method and by gravity pouring. Illustrated in Fig. 2 are the six electric arc furnaces employed for pressure casting, each having a capacity of 10 pounds of metal. In use, the flask containing the precision casting mold is clamped to the top opening of the furnace, after which the furnace is turned upside down and the molten metal is forced into the flask by gravity and air pressure. The castings produced by this method weigh up to 3 1/2 pounds. One of the weight limiting factors is the size of the sprue, which sometimes weighs more than one-half the finished casting.

The induction furnace shown in Fig. 1 has a melting capacity of 150 pounds. Metal from the induction furnace is poured by ladle into the investment mold. Using this furnace, castings weighing up to 20 pounds have been produced.

Precision investment castings are produced in this plant in Monel, Inconel, and nickel, as well as H-Monel and S-Monel, the latter being heat-treatable alloys of unusual hardness and strength. Castings have also been made from nickel irons, nickel steels, and some non-nickel alloys. The mechanical properties of precision investment castings generally run the same as, or slightly higher than, corresponding properties of the same alloys cast in sand.

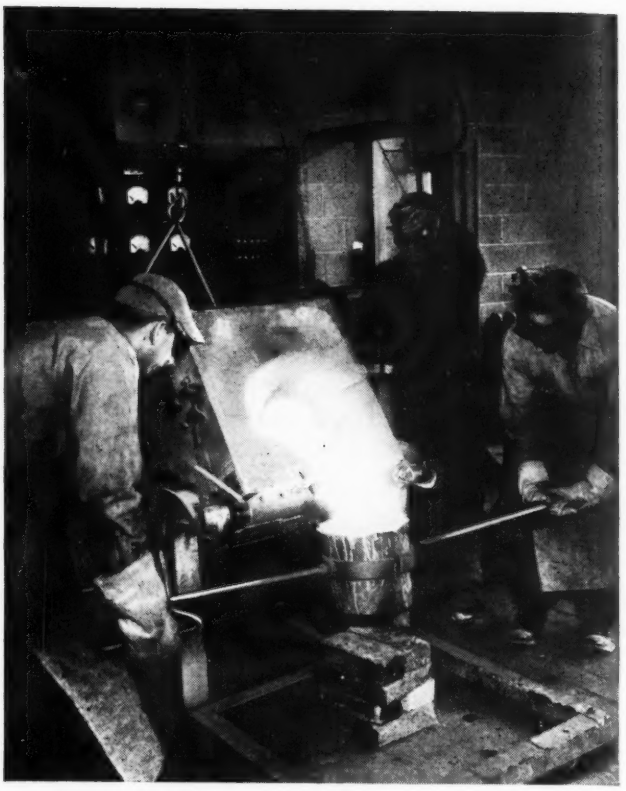


Fig. 1. Induction Furnace with a Melting Capacity of 150 Pounds Used in Producing Castings Weighing up to 20 Pounds

The plant in which these castings are produced is of recent construction, and is equipped with air-conditioning and many other modern features to facilitate operation and provide increased comfort for the workers.

Fig. 2. Six Electric Arc Furnaces Employed in the Bayonne Plant of International Nickel Co. for Making Precision Investment Castings

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Details for Die Designers

By DONALD A. BAKER, Boonton, N. J.

In designing punches and dies, seemingly unimportant details are frequently overlooked which may have an important effect on the operating efficiency and upkeep cost of the dies. With this in mind the writer has prepared a reference sheet for his own group of toolmakers, which shows a number of important die details that have been thoroughly tried out and found to be effective in stepping up the efficiency of dies in which these details have been given too little attention. Simple construction, easy adjustment, and maintenance of adjustment, together with adaptability to standardization, are outstanding characteristics of the details illustrated.

The building of a simple punch and die that will produce a given part is, of course, given first consideration. The next most important factor is the style of stop employed for locating the stock as it passes through the die. In spite of the fact that this item determines the speed with which work can be fed through the die, it seldom receives the attention it deserves.

Next in importance is the method employed to guide the work as it passes under the punches. When solid guides can be used, it is only necessary to make sure sufficient clearance is left to compensate for variations in stock width or slight bends in the stock that would interfere with its free passage. On the other hand, when a spring tension type of guide is used, the designer should keep in mind the fact that a slight change in tension will make all the difference between a smooth working die and one that will be a continuous source of trouble. In fact, the writer would say from his own experience that 90 per cent of the dies of this type in use today have no means by which the tension can be adjusted without taking the die apart and replacing the tension spring with a more suitable one or by bending the existing spring to give the proper tension.

Dies constructed as shown in the accompanying illustration are giving 100 per cent service in our own press room. With these dies, such minor repairs as replacing a broken punch or grinding a die can be done without removing the whole die from the press, because the parts can be easily disassembled.

Referring to the illustration, Fig. 1 shows a plan view of a plain washer die, while Fig. 2 shows an elevation view of the punch and die. In Fig. 1 is shown the swinging type of stop-finger *A* and its control spring *B*, back guide strip *C*, and tension guide *D* with its springs and adjusting screws. The latter parts would not have been necessary with this type of die, but are shown here to illustrate a good tension device. It will be noted that the details indicated by reference letters are also designated by numbers which identify them in the list of details in the illustration. The detail sheets furnished to the designers and toolmakers do not have the reference letters which are used here.

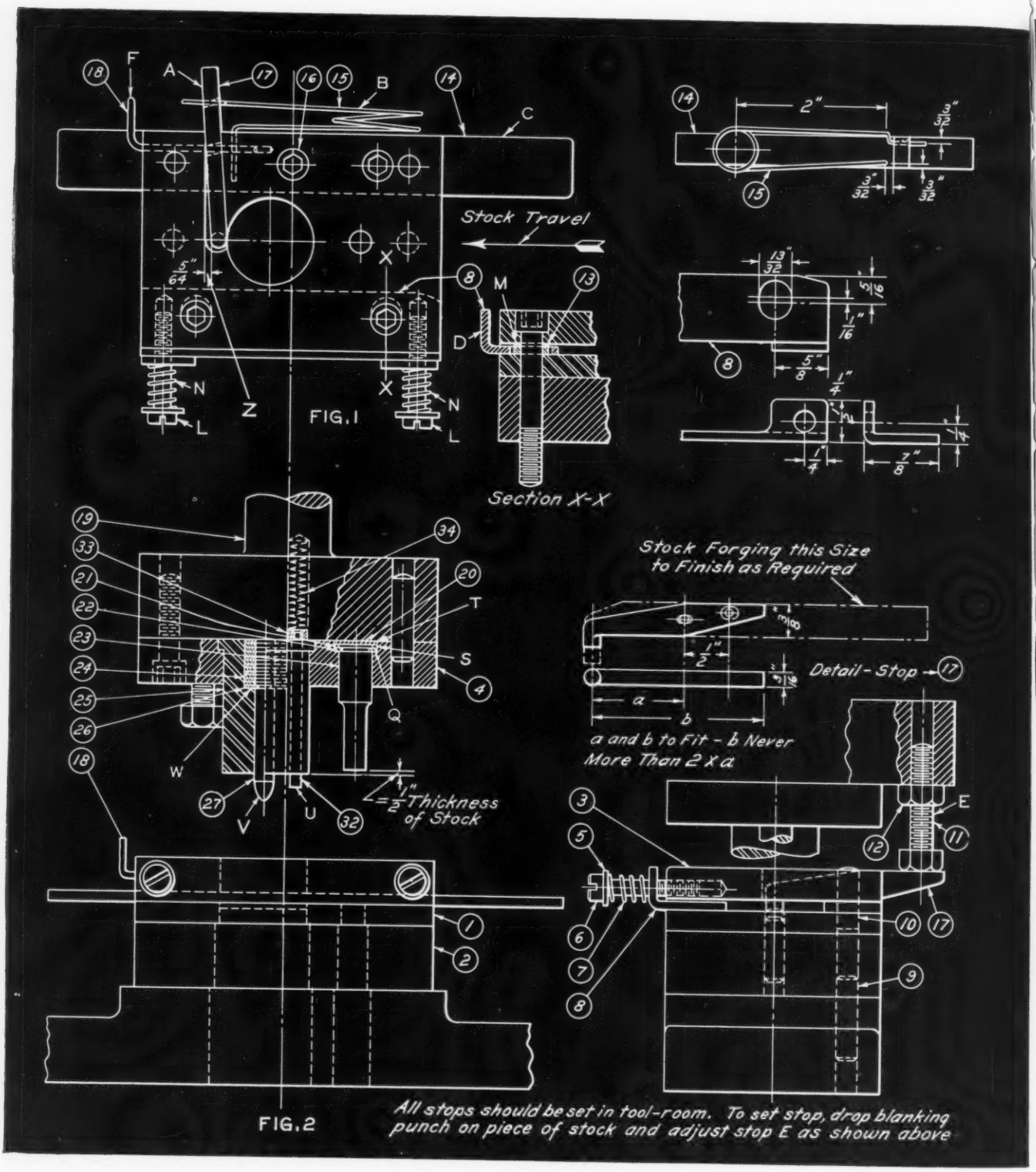
While the style of stop shown is very simple and quite well known, many diemakers and designers apparently fail to fully understand the exact principles involved. In laying out this stop, our first consideration must be to locate the work under the punch so that the pilot carried by the blanking punch will enter the hole previously made by the piercing punch. This location must be such that as the pilot enters the hole, the stock will be pulled away from the stop. The distance that the stock will be pulled away from the stop will depend on the thickness and type of work, and should be sufficient to prevent the blanking punch from forcing the scrap against the stop, causing the stop to bind and wear away or jam and break.

Just as the blanking punch shears through the stock, the adjusting screw *E*, Fig. 2, should strike the end of the stop, so that as downward movement continues, the inner end of the stop is raised above the level of the stock. The tension of the spring *B*, Fig. 1, is such that it swings the stop over the top of the stock at this point. Thus, on the upward movement of the punch the stop will not drop back into its original position on the die but will remain on top of the stock. As the press operator advances the stock, the stop will then drop down into the previously blanked

out hole, and is again in position to stop the stock in the correct position as it advances.

Fig. 3 shows an end stop, which operates on the same general principle as the stop shown at *A*, Fig. 1. In Fig. 3, the arrow indicates the direction of stock travel. Here is shown a different method of holding the stop in position and one that can be applied in places where it is inconvenient to drill for a pin such as shown at *F*, Fig. 1. As seen in Fig. 3, a saw cut is made in the stripper plate to take the pin *G*, which is then held in place by two screw-heads as shown. It will be noted that the hole for pin *G* in this stop must be slotted to provide a lengthwise movement for the stop which takes the place of the swinging movement of the other stop.

One of the most common forms of tension guide plates is shown in Fig. 4. It consists of a



Reference Sheet of Recommended Punch and Die Details

cold-rolled strip *H*, a music wire spring *J*, and a retaining plate *K*, all located under a stripper (not shown). With this design, tension depends upon a concealed spring which cannot be adjusted or repaired without dismantling the die. When this type guide is used, the die must be made about 1/2 inch wider than when using the type shown in Fig. 1. Referring to the guide in Fig. 1, it will be noted from the cross-section *X–X* that this guide consists of a strip of sheet metal *D* with ears turned up at right angles. Holes are drilled in the guide to clear the two fillister-head screws *L*, while two over-size holes are drilled to allow the necessary play around the two washers *M*. Washers *M* are inserted between the stripper plate and the die face and are of sufficient thickness to allow free movement of the guide plate. Any desired ten-

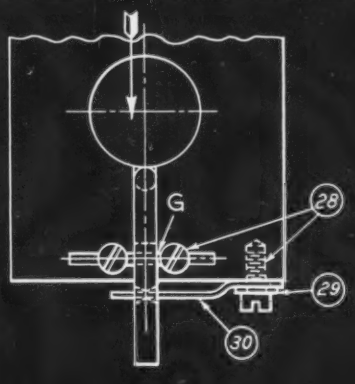


FIG. 3

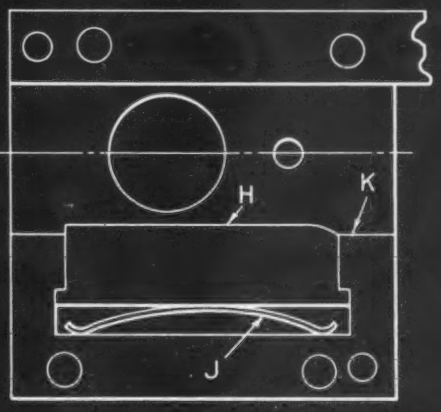


FIG. 4

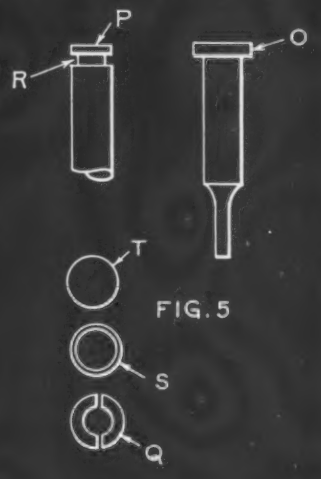


FIG. 5

NOTES

FOR EASE OF ASSEMBLY USE STANDARD HARDENED DOWELS ONLY - AND AS FOLLOWS - 0.001" FREE FIT IN DIE, GUIDE STRIPS AND PUNCH PAD. DRIVE FIT IN BED, PUNCH HOLDER AND STRIPPER. FREE ENDS TO EXTEND 2/3 DOWEL DIAMETER

SCREWS

USE HOLLOW HEXAGONAL HEAD CAPS WHERE NECESSARY TO COUNTERBORE. DO NOT COUNTERBORE UNLESS SPACE COMPELS IN ORDER TO GAIN CLEARANCE - WHEREVER POSSIBLE USE SQUARE OR HEXAGONAL HEAD SCREWS

IMPORTANT -STOPS-

POOR STOPS HAVE RUINED MANY EXPENSIVE AND OTHERWISE GOOD DIES, THEREFORE IT IS IMPORTANT TO THOROUGHLY UNDERSTAND THEIR PROPER USE AND CONSTRUCTION. DISTANCE Z FIG. 1 FOR DETERMINING THE LOCATION OF STOP SHOULD EQUAL THE DISTANCE BETWEEN BLANKS PLUS AN AMOUNT THAT WILL PERMIT PILOTS TO PULL STOCK AWAY FROM STOP ENOUGH SO THERE WILL BE NO BINDING ACTION AS A RESULT OF EXPANSION OF THE STOCK BY THE BLANKING AND PIERCING PUNCHES. STOP SHOULD SWING FROM SIDE TO SIDE THE ABOVE AMOUNT (AVERAGE 5/64) AND REST ON TOP OF STOCK AS PUNCHES ARE WITHDRAWN.

No.	NAME OF PART	QUAN.	MATERIAL & SIZE	NOTES
34	SPRING			
33	PIN HEAD		C.R.S.	
32	SPRING PIN		D.R.	
31	PIN	1	D.R.	
30	SPRING	1	MUSIC WIRE	
29	WASHER	1		
28	FIL. HD. SCREW	3	6 x 32	
27	PILOT		D.R.	HDN.
26	WASHER (PILOT HEAD)		C.R.S.	
25	BLANKING PUNCH		T.S.	HDN.
24	WASHERS		C.R.S.	
23	PIERCING PUNCH		D.R.	HDN.
22	WASHER		C.R.S.	HDN.
21	WASHER		C.R.S.	
20	WASHER DISK		C.R.S.	HDN.
19	PUNCH HOLDER	1	TO SUIT	
18	STOP HINGE PIN	1	DR. 3/32 DIA.	
17	STOP	1	T.S. 3/16 x 3/8	HDN. END.
16	HOLLOW HD. CAP SCREW	8	TO SUIT	
15	SPRING	1	TO SUIT	
14	GUIDE STRIP	1	C.R.S. TO SUIT	
13	SPACE WASHER	2	TO SUIT	
12	HEX. NUT	1	1/4	CYANIDE
11	HEX. HD. SCREW	1	1/4 x 1 1/4	CYANIDE
10	DOWEL	4	1/4 x 3/4	
9	DOWEL	4	1/4 x 1	
8	TENSION GUIDE STRIP	1	TO SUIT	
7	SPRING	2	TO SUIT	
6	FIL. HD. SCREW	2	3/16 x 1	CYANIDE
5	WASHER	2	3/16	
4	PUNCH PAD	1	C.R.S. 1/2 x 2 1/2	
3	STRIPPER PLATE	1	C.R.S. 3/8 x 2 1/2	
2	DIE SUPPORT		C.R.S. 3/4 x 2 1/2	
1	DIE	1	B & S G.S. 1/4 x 2 1/2	HDN. & G.

Prepared for the Use of Designers and Toolmakers

sion may be obtained with this arrangement by simply adjusting the fillister-head screws *L*, which compress the helical springs *N*.

In many shops, a lot of time is wasted by machining the piercing punches from stock of sufficient size to permit forming the head as indicated at *O*, Fig. 5. A much better and cheaper method, once it is standardized in a shop, is that shown at *P*. In this case, the punch is made from a piece of drill rod of the correct body size with the punch end turned down to produce a hole of the required diameter. The other end of the punch has a 1/32- or 1/16-inch groove *R* turned in it to receive a split washer *Q*. Washers *S* are fitted around the head of the punch and, if necessary, a hardened disk *T* is placed directly behind the punch head to help take the end thrust. The washer or washers *S* placed around the punch head, as shown in Fig. 2, hold the split washer *Q* in place and keep it from rolling out of the groove where the stripping action is severe.

Another detail which is not used as often as it should be is the stripper pin *U*, shown in Fig. 2. Many dies producing blanks which are more or less round or rectangular in shape tend to tip the blanks over just as the punch leaves the die. These tipped blanks prevent the stock from being fed forward, and not only slow down production, but are apt to cause shearing of the punch and die. One or two light spring pins *U* in the blanking punch will eliminate this trouble.

Another source of difficulty may be traced to pilots which are incorrectly designed or assembled. As the punch ends are ground away, the pilots protrude farther into the die than is desirable. For pilots having shanks that extend entirely through the punches in which they are assembled and are headed over on the top end of the punch, no adjustment is possible except through grinding off and reheading them. A simple solution of this troublesome problem is obtained by designing the pilot as shown at *V*, Fig. 2. The back or upper end of the blanking punch is counterbored to receive a series of washers. One washer *W* is riveted to the pilot to form a head, and the balance of the washers are drilled so that the pilot will slip through them. When first assembled, the pilot is slipped into place and all the washers are put behind it. As the punch is ground down, one washer at a time is removed and one is assembled under the head of the pilot, shortening the pilot by the thickness of the washer.

The fitting of dowels is a job which should be very carefully and accurately performed. One year of repairing dies in an adding machine factory taught the writer the value of observing certain principles in the use of dowels. They are employed for one definite purpose—that is to hold the various elements in their correct positions. The writer has seen many dies in which the diemaker had made the dowels long enough to go through the stripper plate, die, and perhaps an inch into the die-bed, and had driven them tightly into all of these members. Repairing such a die is a major operation and presents entirely unnecessary difficulties.

When the writer followed diemaking as a trade, a complete set of reamers for use in making dowel holes was carried in his tool kit. These reamers were ground to produce holes of three different sizes—under size, over size, and standard size—and were employed as follows: Standard-size reamers were used in pieces which were to remain soft and where a close-fitting, but not a press-fit, dowel was required. The under-size reamer was used for holes in soft parts where a drive or press fit was required. The over-size reamer was employed for holes in pieces that were to be hardened. The shrinkage in such pieces often made considerable lapping necessary, which could have been eliminated by using an over-size reamer.

The under-size reamer is used first for holes in all parts. The standard- or over-size reamer is employed for holes through the punch pad; the under-size reamer for holes through the stripper, die-bed, and punch-holder; and the over-size reamer for holes through the die. Dowels are then driven into the die-bed, the stripper plate, and the punch-holder. Once in place, these dowels are not removed.

In all cases, the dowels should be driven in until the length of the end extending above the surface does not exceed two-thirds the diameter, or at the most, does not extend a distance greater than the diameter. This is very important, since a greater length will make it difficult to separate the parts, because they will tend to cramp and bind on the dowels. If after assembling the various members, difficulty is experienced in taking them apart with the hands only, the holes should be lapped out sufficiently to permit this to be done.

* * *

General Motors factory workers throughout the country have submitted 100,000 acceptable suggestions for increasing the efficiency of their jobs. Awards totaling $4,000,000 have been made for these suggestions.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

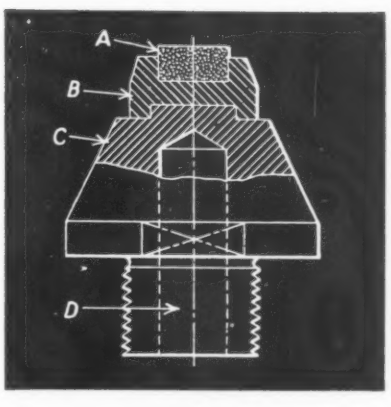
Material for Embossing Rolls

F. C. D.—We would like some advice on the manufacture of embossing rolls which are to be 10 inches inside diameter by 1 1/2 inches thick and have wavy ridges 1/16 inch high by 1/4 inch wide on the outer surface. In operation, these rolls will be heated to 900 degrees F. so as to soften the material being worked. What material would you suggest for such castings?

A.—According to the International Nickel Co., iron alloy with 3 to 3.2 per cent total carbon, 1.4 to 1.8 per cent silicon, 1.5 to 2 per cent nickel, and 0.5 to 0.6 per cent chromium should prove satisfactory. Such an alloy iron would have a hardness of around 250 Brinell in the form described. Since the rolls operate at a high temperature, the heat will gradually tend to soften the metal, and, of course, this softening will occur most rapidly on the edge of the embossed designs. The alloying elements contribute to the stability of the structure under heat and thus increase the life of the castings sufficiently to justify the added cost. While a higher percentage of the alloying elements would increase the hardness still further, it would also result in machining difficulties.

Molybdenum-Steel Riveting

V.A.L.—We are employed in fabricating a number of high-temperature molybdenum-steel structures which are riveted together. The electric riveting machines employed for ordinary steel rivets were fitted with plain tips of tungsten-copper, but the life of the tips has proved to be short when riveting molybdenum steel. As an alternative, tungsten-carbide tips were tried, but these were found to crack under the severe hammering and the tips lasted only for from one to one hundred operations. Can you suggest a method for preventing the cracking of the carbide tips?



Sectional View of Arrangement for Holding Tungsten-carbide Riveting Tip which Avoids Cracking of Tip

A.—The difficulty can be overcome, as shown in the accompanying illustration, by mounting the carbide tip *A* in a molybdenum-steel cup *B*. The tip is brazed to the cup and the cup, in turn, is brazed to the copper electrode body *C;* the latter is provided with a bore *D* for cooling water. A trial with the arrangement described on actual production resulted in seven hundred operations being performed on rivets ranging from 0.34 to 0.405 inch in diameter with comparatively few signs of cracking.

Validity of "Patent Applied For"

P. F.—When an inventor marks a patent "Patent Applied For," can he sue an infringer?

Answered by Leo T. Parker, Attorney at Law
Cincinnati, Ohio

Many inventors and firms have formed the habit of imprinting on their manufactured products the terms "Patent Applied For" or "Patent Pending." However, these markings mean nothing more than that the inventor has applied for a patent. He cannot sue and recover damages for infringement. In fact, unless an inventor receives a patent, he has no legal right to stop infringement.

On the other hand, when an inventor files his application for a patent, he may justly imprint upon his manufactured product the term "Patent Applied For" or "Patent Pending." In this manner, he notifies the public that he is endeavoring to obtain a patent. Many inventors, however, continue to imprint these notifications on their products for many years after the Patent Office has refused to grant them a patent. Thus people are misled into believing that the inventor has some protection when, in fact, he has none.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Carbon-Manganese Bar Steel with Improved Properties

An improved heat-treated carbon-manganese hot-rolled bar steel known as "Ry-Ax" has been announced by Joseph T. Ryerson & Son, Inc., Chicago, Ill. This steel is said to have greater tensile strength, better machining qualities, and a higher fatigue limit than the former steel bearing that name. A special treatment gives it greater endurance when subjected to dynamic stresses and also relieves internal strains. It is particularly recommended for special heavy-duty shafting, such as is used in cranes, armatures, machine tools, and coal-cutting machines. 201

Phenolic Resin Used as Core Binder for Casting

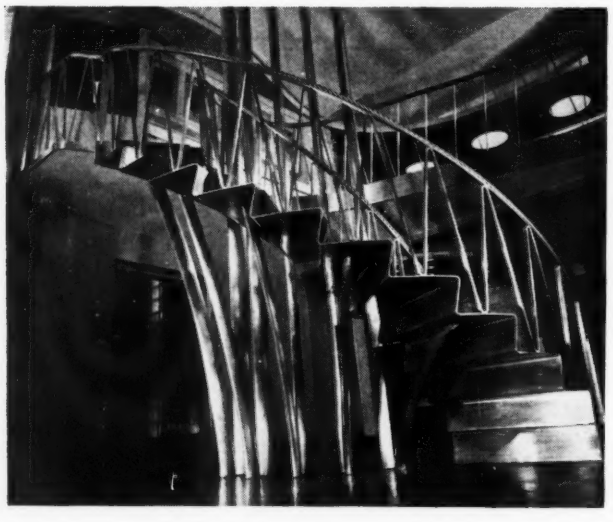
The General Electric Co.'s Chemical Department, Pittsfield, Mass., has developed a new phenolic resin for binding sand cores used in the casting of metals. The material is uniform, flexible, and non-sticky, and has good flow, as well as a low moisture content. Enough dry strength is imparted to the core materials by the phenolic core binder to allow the core to be handled while still warm, and with a minimum baking time and temperature, the core has sufficient strength to withstand pouring temperatures of 2750 degrees F.

The new core binder is designed to have a low hot strength and excellent green strength. It evolves very little gas during pouring, and will not impair the properties of the core material after shake-out. Available in concentrated form, it is easy to mix and convenient to store. . . .202

Aluminum-Bronze Alloy Designed for Die Use

An aluminum-bronze alloy for use in forming and drawing dies has been brought out by Ampco Metal, Inc., Milwaukee 4, Wis. This alloy, known as Ampco Grade 24, has high hardness, unusual compressive strength, and marked wear resistance. In addition, die marks are practically eliminated on the formed parts, reducing the necessity for polishing, buffing, or grinding. It is particularly useful in forming and drawing stainless steel, but has also been used successfully in producing many parts from carbon steel.

By a new method of alloying, extremely hard, fine particles of an intermetallic compound are evenly distributed throughout the matrix. These particles act as minute pedestals to reduce the tremendous pressures and sliding wear of the



This Modernistic Stairway, Fabricated Entirely of Stainless Steel, Leads into the New Stainless Steel Industry Educational Exhibit at 101 Park Ave., New York 17, N. Y. The Exhibit is Free to the Public and Shows Scores of Applications of Stainless Steel, Ranging from Fishhooks to Jet Propulsion Engines

forming process. The softer matrix of the alloy enhances the anti-frictional characteristics of the die surface and provides the non-galling properties necessary in forming stainless steel. 203

Water-Soluble Cutting Oil Provides Rust Protection

Based on a formula extensively used in Germany before the war, a new cutting oil is being produced which also acts as a rust preventive. The compound is being marketed in this country under the name of "Ferox" by the Beacon Rust Proofing Co., 19 W. 31st St., New York 1, N. Y. Soaps or alkalies are not used to keep the cutting oil in suspension, so that, when mixed with water, the solution always remains clear....204

Rustproof Coating for Tools and Machine Parts

A rust preventive, sold under the name "Kano Rustproof," is being manufactured by Kano Laboratories, 75 E. Wacker Drive, Chicago 1, Ill., for protecting tools and machine parts. It is applied cold by dipping, spraying, or brushing, and dries in about fifteen minutes to a clear, hard surface. The resulting coating is tough, flexible, and non-porous. The compound is said to displace moisture and fingerprints, preventing rust on polished surfaces due to handling.

The coating may be removed with any petroleum solvent, although it is not necessary to remove it prior to painting. It can be applied to hand tools, raw stock, and finished parts. Protection under ordinary indoor conditions is provided for periods up to six months or more. For more severe conditions, the compound can be removed and replaced at regular intervals....205

Bright-Annealed Cold-Rolled Stainless Strip Now Available

By a new process developed by the Cold Metal Products Co., Youngstown, Ohio, chrome-nickel steels in dead-soft annealed temper can now be furnished in a bright mirror finish without expensive buffing or polishing. The bright finish is produced by rolling with special tungsten-carbide rolls, and is retained during the annealing operation by a new technique. This product is available in widths up to 7 1/2 inches and in thicknesses of 0.001 inch and heavier.....206

Protective Coating for Metal and Other Surfaces

Metal, wood, leather, and fabric surfaces can be protected from corrosion and deterioration by a transparent liquid "skin" recently introduced by the State Chemical Corporation, 1265 Broadway, New York 1, N. Y.

This compound, called "Permacote," was designed for use on surfaces that require protection from moisture, acids, alkalies, alcohol, dyes, dirt, dust, etc. It can easily be applied by brushing, spraying, or dipping, and forms a tough, transparent coating which remains flexible; is resistant to extremes of heat or cold; and will not crack or chip if the surface it protects should expand or contract. The coating imparts luster to a surface, and seals in and prolongs the life of ordinary paints, lacquers, and varnishes...207

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on these pages, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in August, 1948, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on the blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME..... **POSITION OR TITLE**.....
[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

CITY.....**STATE**.....

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER Sales Engineering Consultant

Entertaining Customers

CUSTOMER entertainment is an important factor in getting business and is used almost universally. If the entertainment offered is on a plane that causes the guests to think more highly of the host, the monetary investment is worth while, because an ideal condition always exists when business relationships develop into close personal friendships.

Entertainment provides a means for knowing and understanding one another better. This is more easily accomplished around a dinner table or on a golf course than in an office where the mind of the customer is occupied by business routine. From this viewpoint, entertainment of a suitable form is desirable and completely justified.

It is essential to remember, however, that the form of entertainment indicates the character of the sales engineer who entertains and also the character of the company he represents. Fortunately, the form of entertainment in the machinery field has greatly improved over the years.

Entertainment should never be niggardly, drab, and meaningless or vulgar, as such entertainment reflects on the character of the sales engineer and of his company and does more harm than good. Also, too great a use of entertainment performs a disservice to industry by adding to the selling costs and consequently increasing prices.

Lavish entertainment pointed at obtaining a contract or inducing the customer to accept faulty equipment is an insult to the intelligence of business men. What fool does not know that the entertainer in such cases simply has his eyes on the order, and that the person on the receiving end will eventually pay the bill? On the other hand, after an important contract has been obtained, it is often highly desirable for men in the buyer's and seller's organizations to become well acquainted. Certainly some form of diversion may be helpful in developing understanding and cooperation.

In too many instances, the sales engineer argues with his firm that extended customer entertainment is necessary because using the boss's dollar is easier for him than using his brain and legs. In many cases, also, the sales engineer advocates the need for elaborate entertainment because he, himself, enjoys it and the personal approbation he receives. He forgets that some friendships that are won through excessive entertainment last only until the check has been paid.

The following are strictly my own rules regarding proper customer entertainment:

1. Entertainment is right and justified as long as it is intended to further fellowship or provide an opportunity to interchange ideas.

2. Entertainment should always be in keeping with the occasion and of high character.

3. Entertainment should be good but not lavish —a good eating place, golf club, or show.

4. Do not give presents at Christmas or other occasions unless they are moderately priced remembrances that have a personal significance. Large gifts constitute graft and should be "out."

5. The payment of customers' expenses for extended trips or similar expenditures constitutes bribery and is reprehensible.

The most fitting entertainment I can remember occurred at a simple camp on the banks of a beautiful little lake in Massachusetts. Our party was driven to the lake in the late afternoon. There was the host—with his sleeves rolled up—there were the refreshments—steaks, "French fries," and all the trimmings. Everything had been selected personally by our host. He cooked the food, he served the guests. What more could anyone do to provide an atmosphere of genuine fellowship?

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Heald Bore-Matics for Large Work

The Heald Machine Co., Worcester 6, Mass., has just announced three powerful new Bore-Matics designed for precision boring, facing, turning, chamfering, or grooving operations on large, heavy parts, such as workheads, tailstocks, cylinder blocks, connecting-rods, pump and compressor bodies, and similar work. The tables of the machines are built low to permit easy loading of heavy, awkward work from conveyors or overhead cranes.

Versatility is achieved by making provision for the installation of multiple or individual boring heads or a special multi-spindle head unit on each bridge as required to suit the job. Roughing and precision finishing can be performed at a single setting.

These new models are all basically the same, except for length, and are the largest machines in the new Heald line. Models 521 and 522, shown in Figs. 1 and 2, are standard single- and double-end machines, respectively; Model 524 is a single-end type with a long base designed to meet extra capacity requirements. All models incorporate the following features: Heavy one-piece base casting with widely spaced, accurately scraped vee and flat ways lubricated by a separate controlled pressure system; covers that protect the ways at all positions of the table; permanently lubricated boring heads; and from one to seven or more individual boring heads or a special multi-spindle head unit, which can be installed on each bridge, as mentioned.

Adequate power up to 10 horsepower or more is provided for heavy roughing cuts and for the high speeds often required when using multiple heads. Variable-speed drives are available when needed. The hydraulic feeds are designed to remain constant, regardless of oil temperature changes, maintaining definite production rates, finish, and accuracy.

Provision has been made on the main control panel of each machine for the convenient installation of units for the operation of hydraulic fixtures, cross-slides, chucks, etc. Simple control settings make available different rates of "in" and "out" feeds when two-way boring is required. Push-buttons for controlling the entire cycle are mounted in the front of the bridge. Double-end machines can be operated from either bridge. All rotating tools are of the same hand, only one design of tools being necessary for the double-end machine.

Sensitive brake adjustments which permit instantaneous action at predetermined points in the cycle cut down boring time and tool wear when facing. The

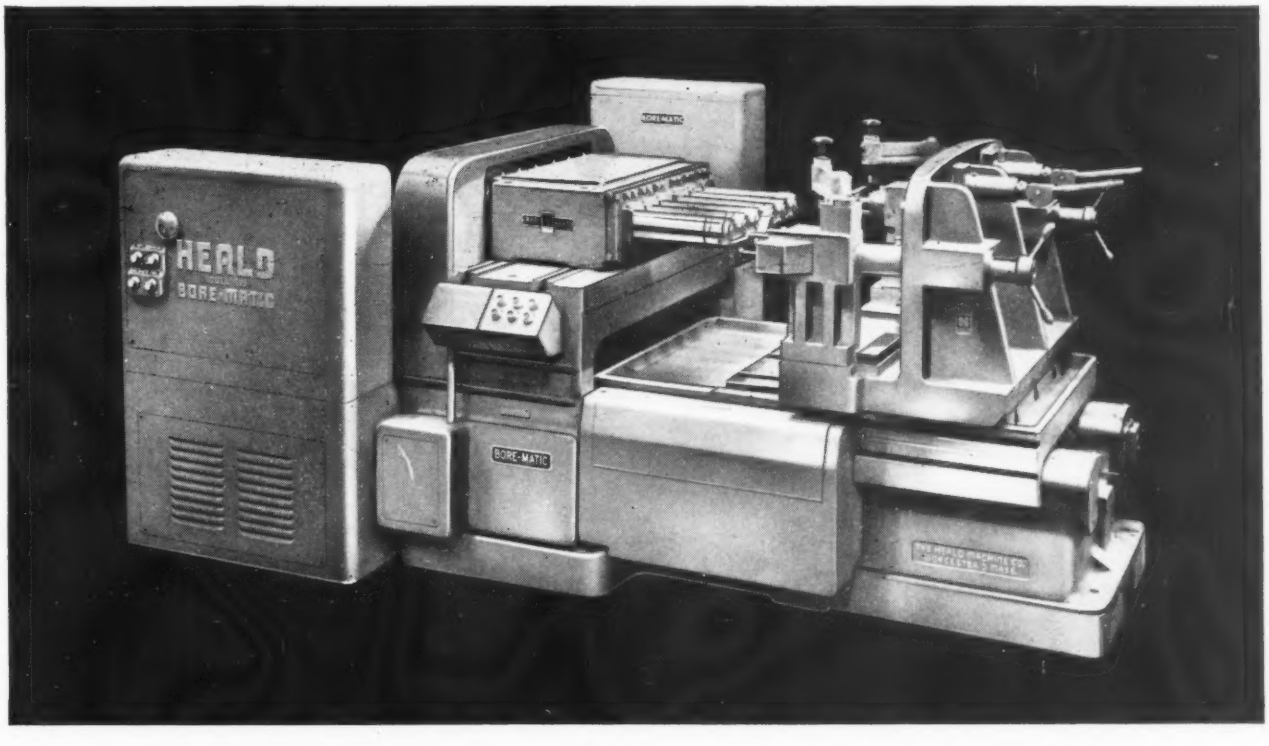


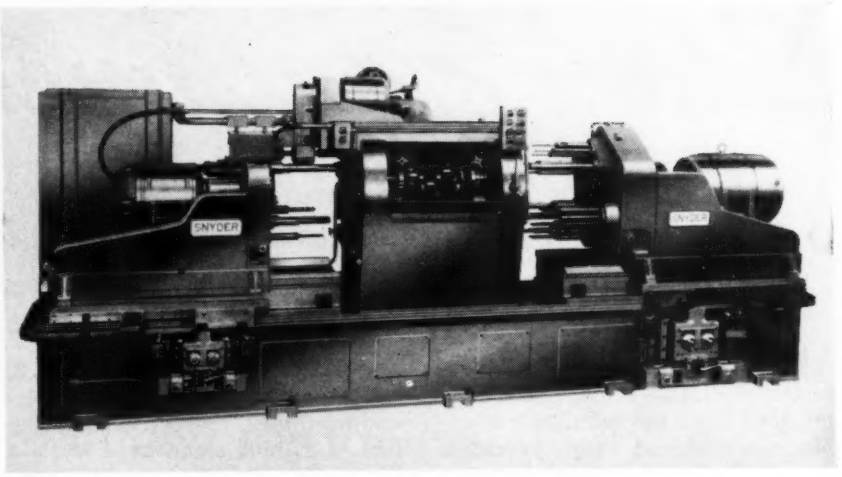
Fig. 1. Heald Bore-Matic Single-end Machine for Precision Finishing of Large Work

To obtain additional information on equipment described on this page, see lower part of page 216.

brake is self-compensating for band wear. The standard hydraulic circuit is capable of being set for a wide variety of cycles, many of which can be entirely automatic except for loading.

The following specifications are the same for all three machines: Width of bridges, 47 inches; width of table, 36 inches; distance from top of table to floor, 22 inches; distance from top of table to top of bridges, 8 inches; table feeds, 1/2 to 32 inches per minute (fast range, in-feed only) and 1/2 to 25 inches per minute (slow range, in-feed, out-feed, or both).

The machine shown in Fig. 1 has a distance from bridge to end of table pad of 48 inches, while the Model 524 machine is made in a standard length with a comparable distance from bridge to end of table pad of 61 inches. Larger capacities can be had. The double-end machine, seen in Fig. 2, is made in three lengths, with distance between bridges of 52, 62, and 72 inches. The smallest machine, when equipped with cutting fluid tank, requires a floor space of 114 by 77 inches and weighs about 15,500 pounds, while the largest machine requires a floor space of 186 by 90 inches and weighs 23,200 pounds. 61



Special Machine Developed for Machining Automotive Crankshafts

Snyder Automotive Crankshaft Drilling and Tapping Machine

A special-purpose machine designed to drill, counter-drill, chamfer, tap, and ream automotive crankshafts, and to maintain accurate relationship of the holes thus processed, has been built by the Snyder Tool & Engineering Co., 3400 E. Lafayette St., Detroit 7, Mich. This machine has two sliding units with 18-inch feeding strokes. The tools are carried in multiple-spindle heads driven by 10- and 7 1/2-H.P. motors. A Geneva-motion indexed six-station trunnion fixture, mounted between the heads, is driven by a 2-H.P. motor. There are five working stations and one loading and unloading station.

The stem end of the crank is drilled, counter-drilled, reamed, and tapped. The flange end has

Fig. 2. Double-end Bore-Matic Designed for Precision Finishing of Large Work

To obtain additional information on equipment described on this page, see lower part of page 216.

six flange holes drilled and chamfered, and three holes drilled, chamfered, and reamed. The large center locating hole in the flange is drilled to depth in two passes, and then combination counterbored and reamed. Drills are run at a surface speed of 60 feet a minute, reamers at 40 feet a minute, and taps at 30 feet a minute. The tapping operation is performed by a lead-screw tapping unit mounted on the trunnion housing. Production is at the rate of 65 machine cycles an hour. The machine requires a floor space of approximately 60 by 170 inches. 62

New Britain Six-Spindle Automatic Screw Machine

The New Britain-Gridley Division of the New Britain Machine Co., New Britain, Conn., has brought out a Model 602 multiple-spindle automatic screw machine, designed as a large-size companion to its Model 601 (1 1/4-inch) automatic. The new machine has a capacity of 2 1/4 inches.

The six cross-slides of the machine are radially located with respect to the center line of the spindle-carrier, and are 60 degrees apart. This symmetrical radial arrangement gives the same line of forming thrust in each position and allows the tool-holders of the five heavy-duty forming slides to be interchanged.

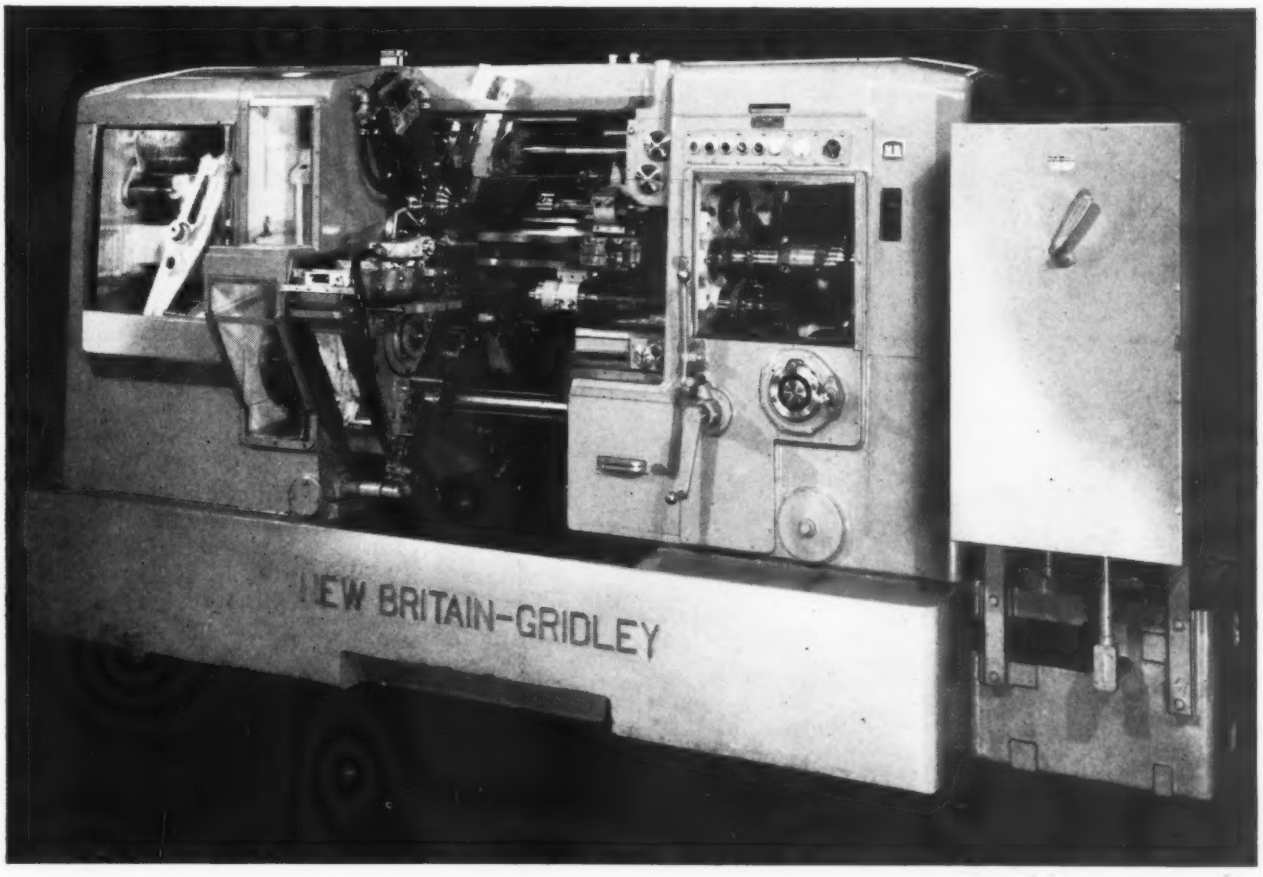
Carbide tooling can be applied to this machine because of its weight and ruggedness. Cross-slide cams, located within the cross-slide mountings and directly behind the slides, are designed to eliminate any deflection. The increase in chips from high-speed carbide production is taken care of by the wide open tooling area, large chip pan, and chip conveyor.

The interchangeable tool-holders and easily changed cross-slide cams and attachments facilitate set-ups. A universal main tool-slide adjustment permits the selection of any ratio of approach to feed without changing the high point, drawback, stops, or stroke. Stock feed-out length is adjusted without changing cams. 63

Studebaker Portable Hydraulic Press with Electrically Heated Platens

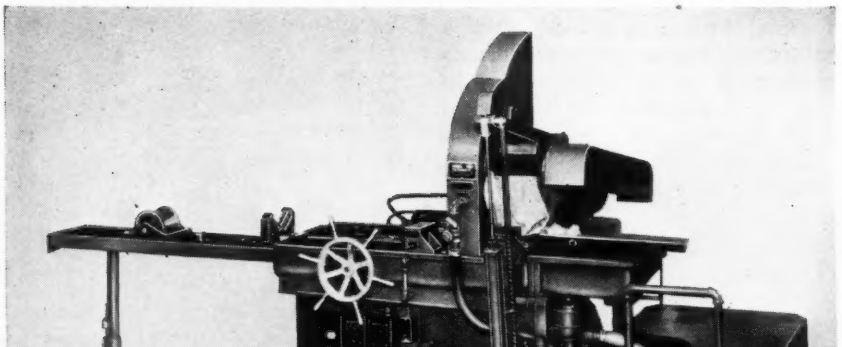
Studebaker Hydraulic Press

A self-contained, hand-operated, portable hydraulic press for laboratory or production work is being introduced by the Studebaker Machine Co., 1221 S. Ninth Ave., Maywood, Ill. Optional equipment includes electrically heated platens for molding plastics or other



New Britain Six-spindle Automatic Screw Machine Designed to Handle Large Work. The Machine Illustrated has Transparent Panels in Place of Regular Metal Ones to Permit View of Operating Members

To obtain additional information on equipment described on this page, see lower part of page 216.



"Cutmatic" Semi-automatic Wet Abrasive Cutting Machine

work requiring the application of heat. Thermostatic control insures even distribution of heat.

Operation of the hand-lever produces up to 8 tons pressure between the platens. The press can be adapted for broaching, assembling, piercing, oil-grooving, riveting, sizing, forming, flanging, staking, forcing, and trying out small dies. Special dies can be developed for any type of product requiring press work. The press has a base 10 by 10 inches in size, and is 13 inches high. The hydraulic ram has a travel of 3 inches. The platens measure 5 1/2 by 7 inches, and have an opening range from 0 to 6 inches. The press weighs 70 pounds. 64

Improved Model of Screw Machine Brought out by the Elgin Tool Works

Semi-Automatic Wet Abrasive Cutting Machine

The Campbell Machine Division, American Chain & Cable Co., Inc., Bridgeport 2, Conn., has just announced a new model semi-automatic "Cutmatic" wet abrasive cutting machine, which has an oscillating swing frame, a work feeding and holding mechanism, a coolant system, and a hydraulic work-clamping and wheel-feeding unit. Solid stock up to 6 inches in diameter or any shape material of comparable size can be cut off on this machine.

The abrasive wheel is automatically fed through the work, and upon completion of the cut, is automatically returned to the starting position. The return of the wheel is controlled in such a manner as to compensate for wheel wear. The handwheel-operated feed carriage also acts as a length-gage bar for cutting pieces and serves as an ejector for the cut-off work. The work is firmly clamped on both sides of the cut-off wheel while the cut is being made. A hydraulic gripper incorporated in the feed carriage is timed to act with the clamps at the wheel so that the work-bar is firmly held by one or the other of the two holding devices at all times. 65

Elgin Screw Machine

The Elgin Tool Works, 1770 Berteau at Ravenswood Ave., Chicago 13, Ill., has announced a Model ET 5C standard screw machine in which recently developed improvements have been incorporated. With the exception of an entirely new turret, this machine is basically the same as the preceding model. The new heavy style turret, with hardened and ground ways, is said to be very sensitive and easy to index.

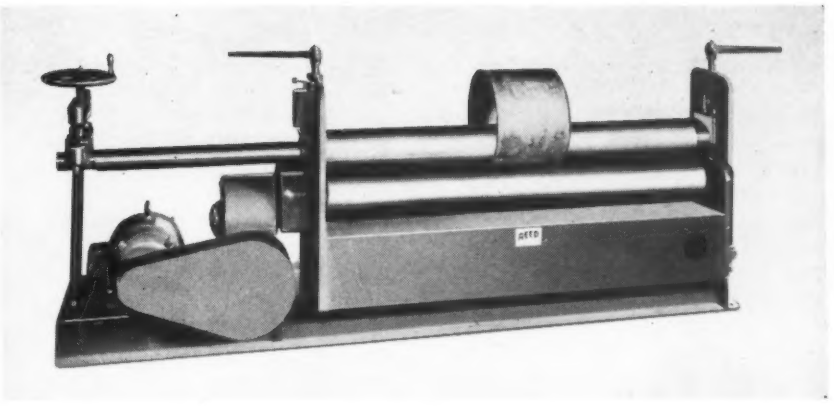
The turret is of the flat-head style, the head turning in roller bearings. Changes in the extension of the spindle have been made, so that the cut-off or forming tools in the double tool cross-slide can be placed very close to the collet. The turret tools need no extensions, particularly for small taps and drills, as the turret can be brought up close to the collet. The base and the variable-speed drive have not been changed. 66

To obtain additional information on equipment described on this page, see lower part of page 216.

Reed Pyramid Type Bending Rolls

New pyramid type bending rolls, known as Series 650, have recently been placed on the market by the Reed Engineering Co., 1003-17 W. Fairview Ave., Carthage, Mo. These machines are of all-steel construction and are designed with a high roll clearance between the top and lower rolls to permit the rolling of heavy bars and light structural shapes, as well as plates. The two lower rolls are also spaced close together to minimize the forming of a flat spot. The top roll on all sized machines is 7 1/2 inches in diameter, and the two lower rolls are 6 1/2 inches in diameter.

Standard equipment on all models includes bronze bearings throughout; silent worm-gear drive; top roll indicators; electric reversing control for direct motor drive; and anti-torque type frame and ratchet wrench adjustment of the top roll. The new machines are built with drop-end construction, which permits the removal of fully rolled cylinders from the top roll. Standard equipment also includes a 5-H.P. main driving motor, which operates the rolls at a surface speed of approximately 18 feet per minute. These machines are built in four standard sizes, with capacities ranging from 4 feet by 7/16 inch to 8 feet by 1/4 inch. The smallest machine is 26 by 100 inches in size, and weighs 3650 pounds, while the largest is 26 by 148 inches and weighs 5450 pounds. 67

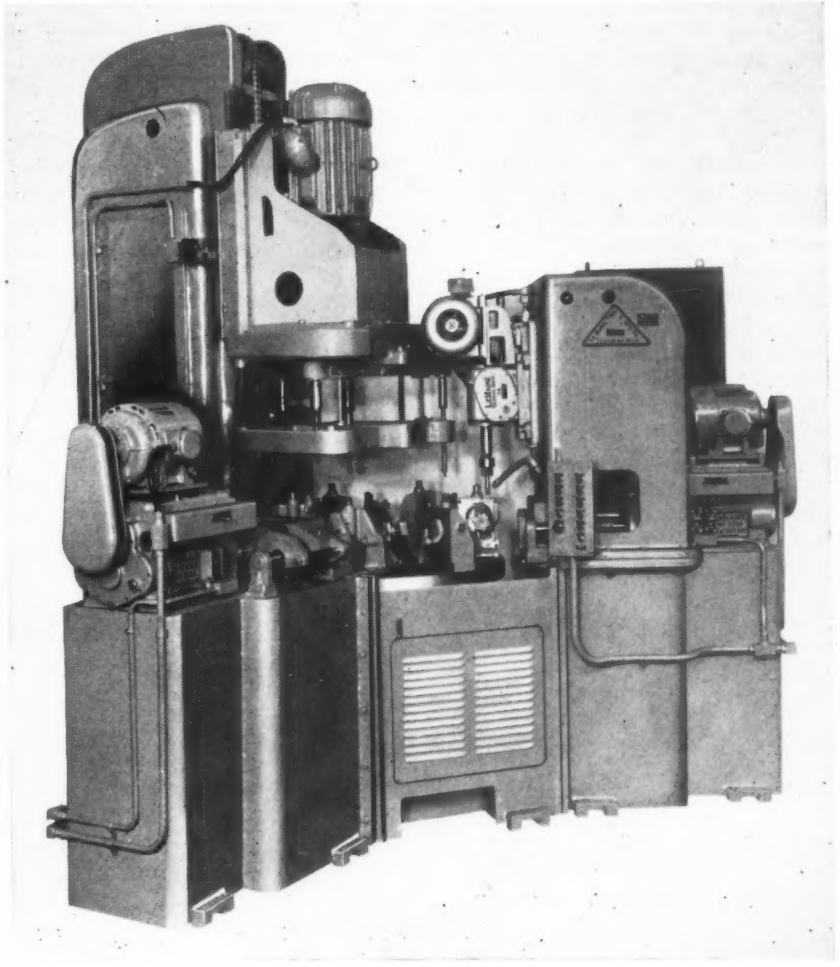


Pyramid Type Bending Rolls Brought out by the Reed Engineering Co.

LeMaire Automatic for Machining Automotive Bearing Retainers

The LeMaire Tool & Mfg. Co., 2657 S. Telegraph Road, Dearborn, Mich., has recently designed an automatic machine for drilling, spot-facing, reaming, countersinking, and tapping seven holes in automotive-transmission rear-bearing retainers at the rate of approximately 138 retainers per hour. Three different types of units have been combined to obtain efficient operation and accurate work. The vertical slide type drilling unit provides ample support for the four-spindle head. Two small horizontal twin-ram quill type drilling units with single spindles, and a small vertical lead-screw tapping unit having a single spindle are also employed. These units are mounted on a fabricated steel frame and are grouped around a six-position work-table, 36 inches in diameter, which is equipped with a hydraulic indexing mechanism.

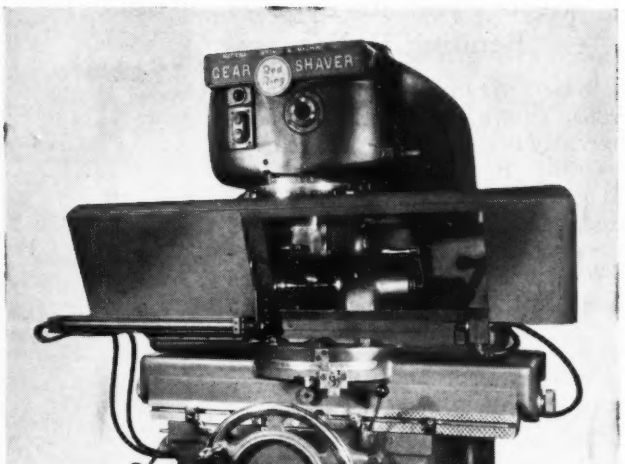
The table of this machine carries six quick-acting fixtures arranged to complete one part at each cycle of the machine, and the coolant is pumped from a tank in the table base. A single push-button operates the automatic cycle and is pressed by the operator as soon as the part has been loaded. Other buttons control separate heads and are used in setting up the machine. 68



Special Automatic Machine for Machining Automotive Bearing Retainers Brought out by the LeMaire Tool & Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 216.

Grand Rapids Drill Grinder Announced by the Gallmeyer & Livingston Co.



Red Ring Gear-shaving Machine with New Tailstock and Splash Guard

Grand Rapids Drill Grinder

A line of twist-drill grinding machines in sizes suitable for sharpening drills from No. 52 to 4 inches in diameter has just been placed on the market by the Gallmeyer & Livingston Co., 305 Straight St., S. W., Grand Rapids 4, Mich. The double-holder machine illustrated is designed to sharpen two-, three-, and four-flute drills of either straight-shank or taper-shank type at the standard 59-degree angle. This machine has a capacity for sharpening twist drills up to 2 1/2 inches in diameter. The smaller drills are ground dry on one side of the machine, and the larger ones are ground wet on the opposite side.

The drill-holders are equipped with a rectangular rest which supports the lip of the drill and which is reversible from side to side or from top to bottom should it become worn in one position after sharpening hundreds of drills of one size. This rest is designed to insure proper clearance back of the drill cutting edge. The portions of the cutting lip near the center are ground with a greater angle than those near the periphery. A diamond truing device for dressing the face of the grinding wheel automatically maintains the proper relationship between the holder and the face of the grinding wheel. The machine illustrated is equipped with 12-inch diameter grinding wheels and with a 1 1/2-H.P. ball-bearing motor for the spindle drive. The coolant pump is driven by a V-belt from the same motor. 70

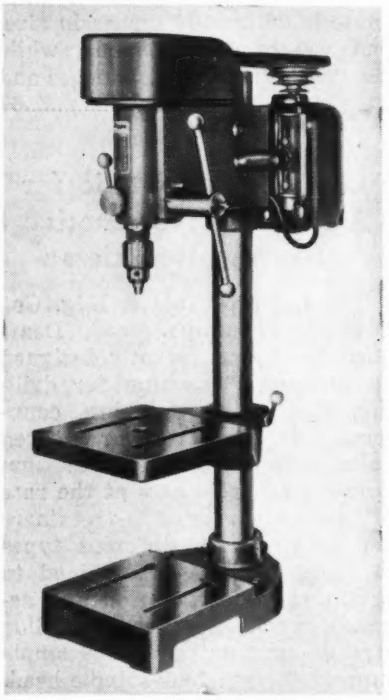
"Fast-Lock" Tailstock and Automatic Splash Guard for Red Ring Gear-Shaving Machines

The National Broach & Machine Co., 5600 St. Jean, Detroit 13, Mich., has announced two new developments for application to its line of Red Ring gear-shaving machines. One of these is a "Fast-Lock" tailstock which reduces the operation of loading and unloading the work to one motion, and the other is an air-actuated electrically controlled automatic splash guard. The new screw advance and locking mechanism of the tailstock makes it possible to lock the work by merely pushing the handle away and to retract the tailstock for unloading by pulling back on the handle.

The new splash guard is available in several designs to meet varying conditions. With this guard, the operator simply loads the work and presses the starting button, which automatically closes the door, starts the coolant flow, and begins the cutting cycle. When the cutting cycle is terminated, the coolant is shut off and the door opened automatically. ..71

Reypo Drill Press

The 15-inch drill press illustrated is a recent addition to the line of machines manufactured by the Reypo Corporation, 5751 W. 98th St., Los Angeles 45, Cal. A depth stop which operates di-



Drill Press Made by the Reypo Corporation

To obtain additional information on equipment described on this page, see lower part of page 216.

rectly on the feed pinion between the two lower quill bearings and thus eliminates any side thrust or deflection of the drill point is a feature of the new drill press. This machine is equipped with a quick-setting gage calibrated in sixteenths of an inch.

The spindle of this machine has a travel of 4 inches and four speeds ranging from 630 to 4850 R.P.M. A free-floating drive, designed to prevent whip or misalignment, is carried in two sealed ball bearings. The drive is through involute splines and keys. The head is provided with three quill bearings. Two additional sealed ball bearings carry the spindle. Both the table and base have ground working surfaces 10 by 10 inches and are provided with parallel slots for 1/2-inch bolts. 72

Precision Lapping Machine

A precision lapping machine known as the "Lapmaster" has been designed by the Crane Packing Co., 1800 Cuyler St., Chicago, Ill., and is now being manufactured by this company's plant at Wilmington, Calif. The new machine is applicable either on production runs or individual jobs.

An outstanding feature is the lapping plate, which is continuously conditioned so that it affords controlled accuracy in lapping flat, concave, and convex parts. It will hold such work to accuracy limits within 0.0000116 inch, or less than one light band per inch of work surface, and maintain micro-inch finishes of 1 to 3 r.m.s.

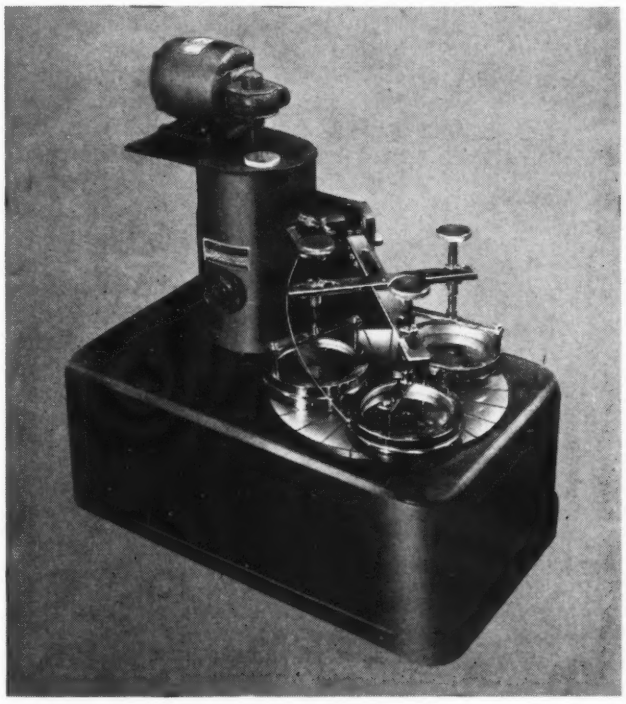
The "'Lapmaster" embodies a continuously agitated compound tank, an alloy-iron lapping plate driven by a gear reduction motor, and three combined work-holders and wear rings, which are held in place by adjustable bars. The lapping cycle time is automatically controlled by a clock, which stops the lapping plate and closes the compound valve at the end of a predetermined period. Since the wear rings wear the lapping plate throughout the entire lapping cycle, at a faster rate than the wear caused by the work, the lapping surface is continuously conditioned. For this reason, skilled operators are not required, since it is only necessary to load and unload the work and start the automatic lapping cycle.

The "Lapmaster" illustrated is equipped with a 12-inch lapping plate and three wear rings with an internal capacity of 4 1/4 inches. Other larger models are available with lapping capacities that adapt them for handling work up to 36 inches. 73

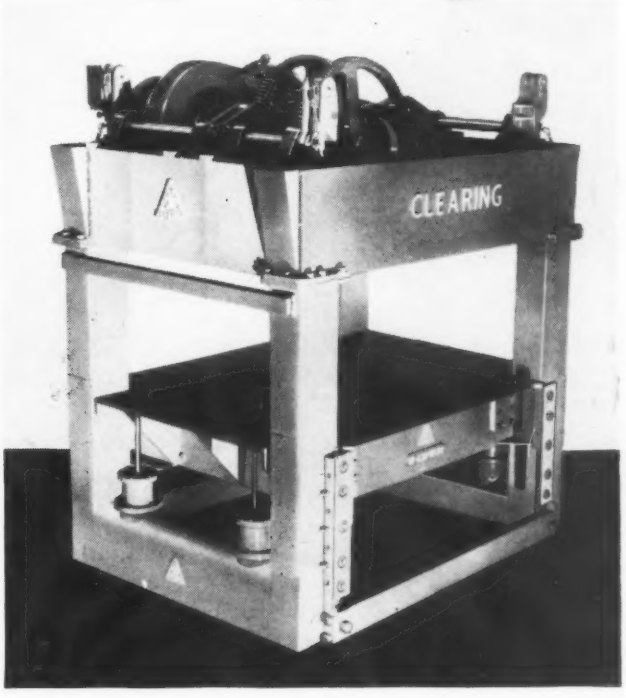
Clearing Spot-Welding Press

The Clearing Machine Corporation, 6499 W. 65th St., Chicago 38, Ill., has developed a spot-welding press for handling large complicated sections rapidly and efficiently. Several welds can be made at the same time with this press. It is actuated by a toggle link mechanism, an upward movement of the platen serving to bring the work to the electrodes.

The welding operation is controlled automatically from a special panel. At the top of each stroke, a contact of the control system energizes the automatic welding panel. The welding panel then assumes control, causing the actual welding process to be performed in the required sequence with the correct timing while the press dwells in the closed position. At the end of the welding operation, a contact on the welding panel transfers the control back to the press control panel, which immediately allows the platen to return to its open position. 74



"Lapmaster" Precision Lapping Machine Developed by the Crane Packing Co.



Automatically Controlled Welding Press Built by Clearing Machine Corporation

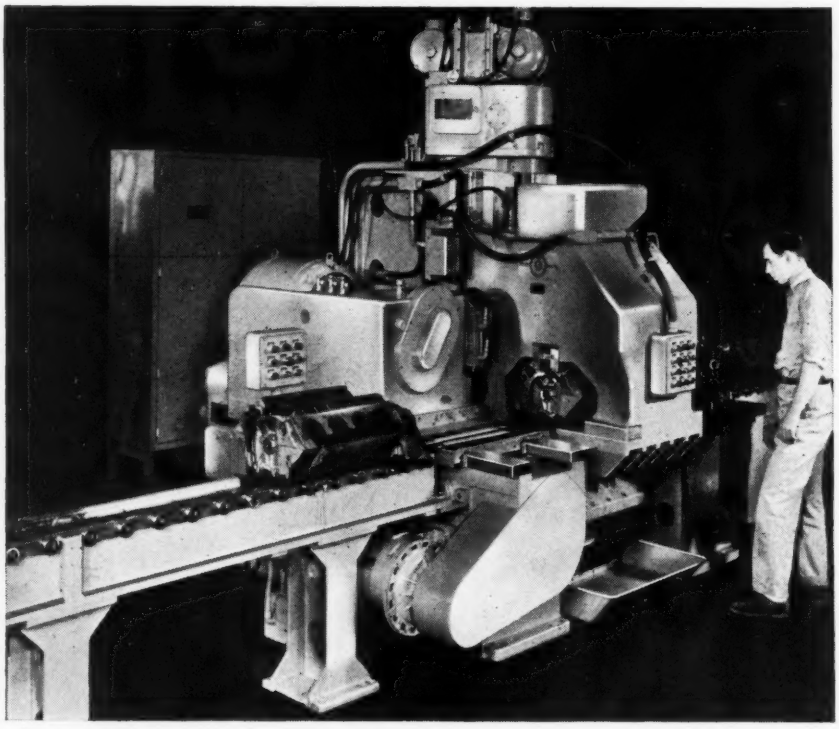
To obtain additional information on equipment described on this page, see lower part of page 216.

Sundstrand Special Rigidmil for Machining Cylinder Blocks

A special Rigidmil designed recently by the Sundstrand Machine Tool Co., Rockford, Ill., automatically mills both ends and the main bearing faces of an automotive cylinder block in a single clamping of the work. The machining of these surfaces in one set-up reduces the work-handling time and insures that the ends and the bearing faces are accurately finished in correct relation to each other.

Two 15-H.P. horizontal, single-spindle heads, provided with transverse feed on the slide-ways at both ends of a rising and falling fixture, face-mill the ends of the block. A 7 1/2-H.P. head, mounted in the machine base, has an arbor equipped with cutters for straddle-milling the main bearings.

The conveyor-fed block enters the loading position on a hydraulically operated shuttle. The automatic cycle, started by a push-button, carries the block into the fixture, where it is hydraulically clamped. The two opposed horizontal heads are fed simultaneously for the face-milling operations on both ends of the block. At the end of the feeding movement, the cutters retract and the heads are returned to their original positions by rapid traverse. The fixture then feeds downward for the straddle-milling operation on the main bearing faces. Upon the completion of this operation, the fixture rises, releasing the clamping pressure and ending the cycle. At the start of the next automatic cycle the finished block is shuttled out the opposite side of the fixture. 75



Special Rigidmil for Finishing Both Ends and the Bearing Faces of Cylinder Blocks in One Set-up

Hauser Internal Jig-Grinder

The Hauser Machine Tool Corporation, Manhasset, N. Y., is introducing on the American market an internal jig-grinding machine built by Henri-Hauser Ltd. of Bienne, Switzerland. This machine permits the grinding of holes to accurate lay-outs, on the basis of coordinates, after hardening. The work is carried out exactly as on a jig-borer, the only difference being that an oscillating grinding spindle is used in the machine instead of a boring spindle.

Only one centering operation is required for grinding all the holes in a part. The machine is intended primarily for use in the manufacture of gages, templets, jigs, etc., but is also extensively employed in the production of press tools. Easily read illuminated dials and verniers are provided to facilitate precision readings to within 0.0001 inch.

Internal Jig-grinding Machine Introduced by Hauser Machine Tool Corporation

A 1/6-H.P. motor provides the drive for both the planetary and reciprocating motions of the grinding spindle within limits of 5 to 20 millimeters. The grinding wheel is driven by a compressed air turbine at speeds up to 40,000 R.P.M.

The maximum grinding diameter is 23/32 inch; automatic vertical travel of grinding spindle 3/16 to 3/4 inch; working surface of table, 14 1/2 by 9 1/2 inches; and longitudinal and transverse movements, 8 inches. 76

Gear-Shaving Cutter for Finishing Gears Located Close to Shoulders

The National Broach & Machine Co., 5600 St. Jean, Detroit 13, Mich., has announced that their "Red Ring" engineering department has developed a new

To obtain additional information on equipment described on this page, see lower part of page 216.

conical involute cutter designed to overcome the difficulty of shaving gears by the rotary crossed-axes principle where shoulders are located close to the gear. This difficulty varies inversely with the amount of clearance available. With very small clearances, the angle between the axes of cutter and work-gear may become so restricted that the cutting action is seriously reduced and machining time unduly increased. By tipping the work away from the new cutter, an angle of sufficient size is obtained between the axes of cutter and work-gear to obtain an excellent cutting action, which results in a substantial reduction in the time required for the gear-shaving operation.

In handling this kind of work, the gear to be shaved is set at an angle with the cutter, as shown in the illustration. In this case, the clearance between the work-gear and the larger gear is only 1/8 inch. The quick-acting tailstock facilitates loading and unloading the work.

This new method of shaving is applicable to spur and helical gears or gears with teeth which are tapered away from or toward the shoulder gear, a typical example of the latter condition being clutch gears of automotive transmissions. 77

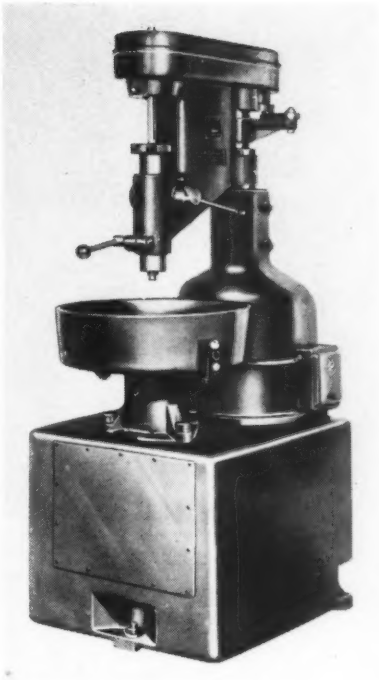


Fig. 1. "Microflat" Machine Designed for the Precision Finishing of Flat Surfaces of Any Shape or Size

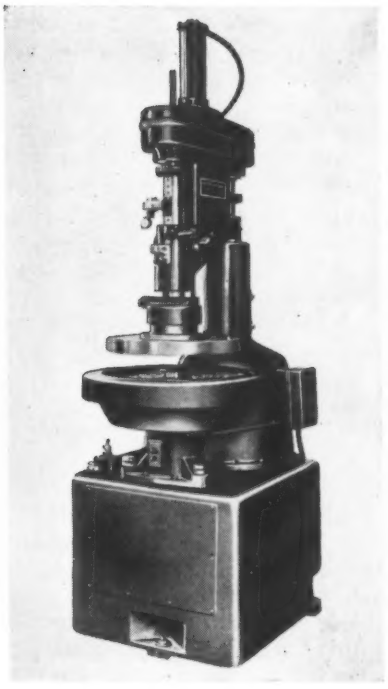
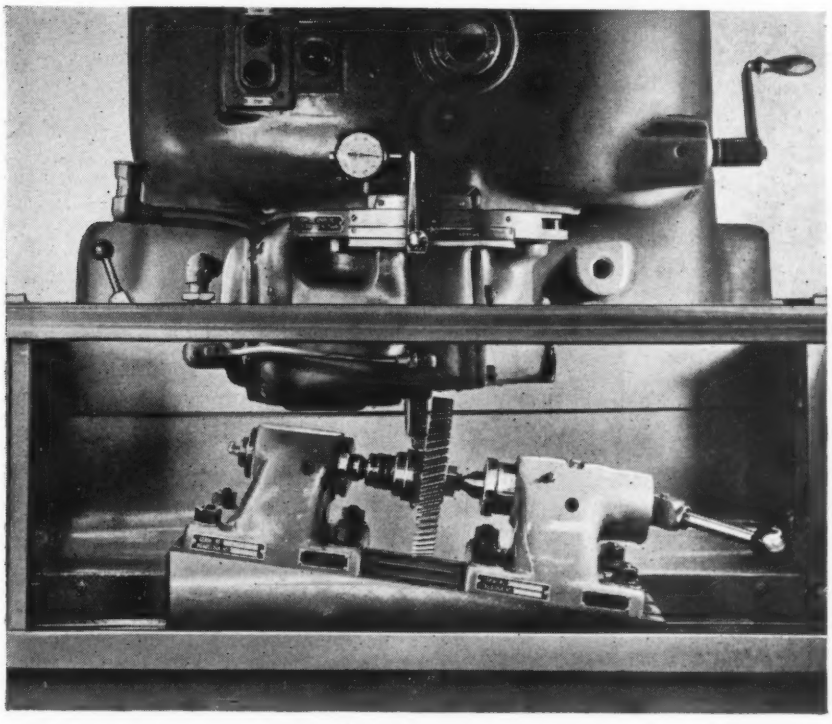


Fig. 2. "Microflat Machine for the Precision Finishing of Opposite Parallel Sides of Parts Simultaneously

"Microflat" Machines for Finishing Flat Surfaces

The Micromatic Hone Corporation, 8100 Schoolcraft Ave., Detroit 4, Mich., has purchased the engineering drawings and patents of the Ultra Lap Co. and has announced that it will manufacture a line of machines for finishing flat surfaces under the trade name "Microflat." The present series of six models includes two types of Microflat machines, both of which use either bonded or loose abrasives. One type (Fig. 1) will finish flat surfaces, regardless of the shape or size of the part. The other (Fig. 2) will finish simultaneously two opposite sides of parts parallel within 0.0001 inch.

One or many parts can be processed simultaneously on these machines. The surfaces produced will be optically flat within one light band, and can be held to a finish of 1 micro-inch r.m.s. or less if desired. Any material ranging from soft copper to quartz or Nitralloy can be finished with this equipment. 78



"Red Ring" Gear-shaving Machine Equipped for Shaving Gears Located Close to Shoulders

Liquid Wax Lubricant for Metal Slugs to be Formed by Impact Extrusion

A liquid wax for use as a lubricant in the manufacture of parts by the impact extrusion process has been developed by S. C. Johnson & Son, Inc., Racine, Wis. In

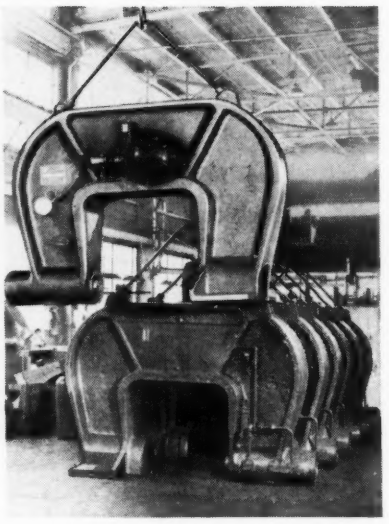
To obtain additional information on equipment described on this page, see lower part of page 216.

impact extrusion, a waxed metal slug is placed in a die and struck a single hard blow with a punch, causing the metal to flow smoothly out of the die and shoot up the sides of the punch, thus forming a collapsible tube. The new lubricating wax can be easily applied to the slugs before extrusion by either dipping or tumbling. Slugs coated with the wax lubricant are easy to handle, and the coating will not turn rancid. 79

Watson-Stillman Portable Hydraulic Press

A portable press of 200 metric tons capacity, designed primarily for forcing locomotive crankpins into wheel centers, has just been added to the line of hydraulic railroad shop equipment manufactured by the Watson-Stillman Co., Roselle, N. J. This press is made especially for use in European railroad shops, where an overhead crane carries the forcing equipment to the driving wheel sets.

The capacity of the machine is adjustable by means of a by-pass valve. The press has a stroke of 10 inches, a pressing speed of 4.9 inches per minute, and a return speed of 17 inches per minute. The maximum opening between the ram face and the frame is 2 feet 10 inches. The press weighs approximately 11,000 pounds.....80



Watson-Stillman Portable Hydraulic Press Designed for Railway Shop Use

Mercury Hydraulic Press

The Mercury Engineering Corporation, 2100 N. Farwell Ave., Milwaukee, Wis., has added a new hydraulic press to its line. Although originally developed for die cutting and embossing paper products, this press is also being used in the sheet-metal, plastics, and other fields. An unusual feature of the machine is the traveling lower platen, which moves vertically under hydraulic pressure. The upper platen carries the dies in a fixed position, and is provided with either air or spring knockouts. The self-contained hydraulic unit is enclosed in the base.

The press has 20- by 24-inch upper and lower platens, is rated at 25 tons with fifteen 1-inch strokes or three 5-inch strokes per minute, and can be equipped with standard 3 1/2-inch high cutting dies or special tooling. 81

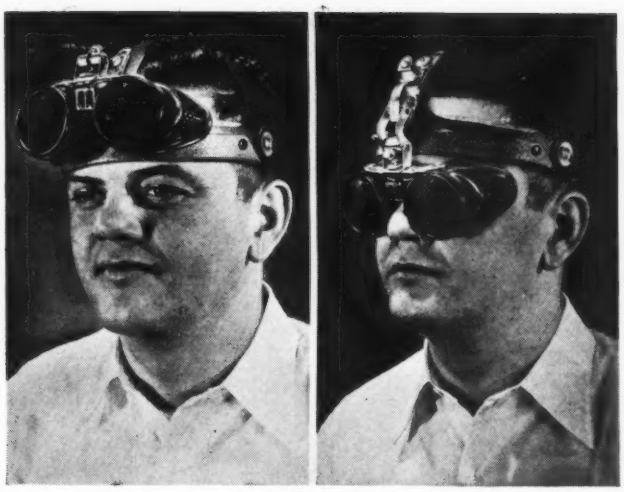
"Airlite" Air-Powered Light Generator

A portable generator for operating two 75-watt 115-volt electric light bulbs which weighs only 8 3/4 pounds and can be driven by compressed air is a new accessory for air compressors recently brought out by the Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. This generator enables the air compressor to furnish light for work performed by air-operated tools, as well as the power for the tools. 82

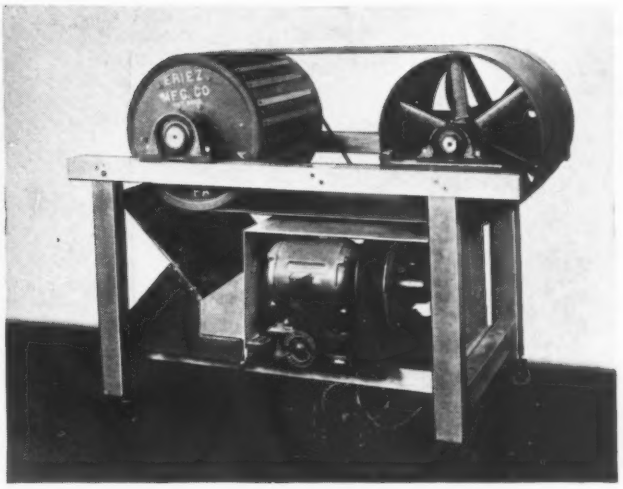
Hydraulic Press Adapted for a Wide Variety of Work

Portable Electric Light Generator for Air Compressors

To obtain additional information on equipment described on this page, see lower part of page 216.



Head-rest Safety Goggle Recently Added to the Line of the American Optical Co.



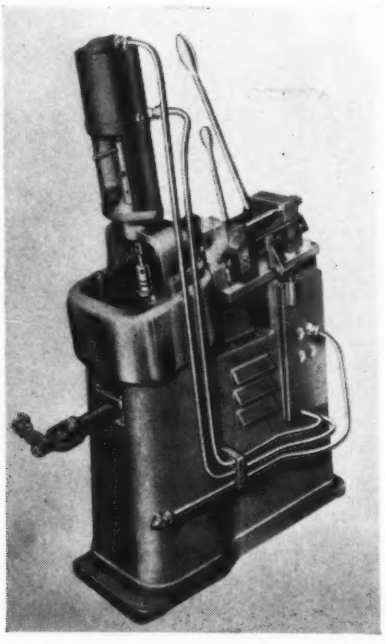
"Puri-Pulley" Unit for Removing Fine Iron Particles from Non-ferrous Materials

Head-Rest Safety Goggle

A new head-rest safety goggle designed to give maximum comfort, convenience, and protection for gas welders, burners, cutters, and furnace men has been added to the line of the American Optical Co., Southbridge, Mass. This goggle is provided with a spring mechanism which permits it to be instantly thrown into the "off-guard" position by a flick of the wrist. It can be quickly adjusted to fit the contour of the face and to the correct pupillary distance. The "Duraweld Coverglas" of the goggle protects the eyes against injurious light radiations, flying sparks, and scale. The goggle can be worn directly over the eyes or over prescription glasses. 83

Small-Size Die-Casting Machine

The DCMT Sales Corporation, 315 Broadway, New York 7, N. Y., has announced a new small-size air-operated die-casting machine designed for economical production of small zinc-alloy parts at high speed. Although exceptionally simple to operate and very light in weight, this machine will easily maintain a production rate of 20,000 shots per week. It is designed for optional hand or foot control, and has an air system with integral pilot and ram valves. An adjustable baseplate permits the use of die-blocks of any desired thickness. A new type pot employs hydraulic suction for filling the cylinder with molten metal. 84



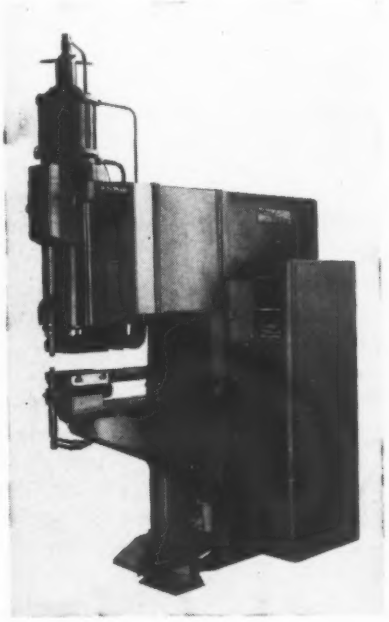
Small-size Air-operated Die-casting Machine

Magnetic Pulley for Removing Iron Particles from Non-Ferrous Materials

A non-electric magnetic pulley, designed to remove fine iron or other magnetic particles from non-ferrous powdered materials ranging from 10 to 200 mesh size, has been brought out by the Eriez Mfg. Co., 575 Commerce Bldg., Erie, Pa. This new product, known as the "Puri-Pulley," has an Alnico magnet which exerts a concentrated pull close to the faceplate. It is designed especially for use as a head pulley in belt conveying systems, and is available in 18- and 24-inch diameters, for belt widths ranging from 12 to 60 inches. 85

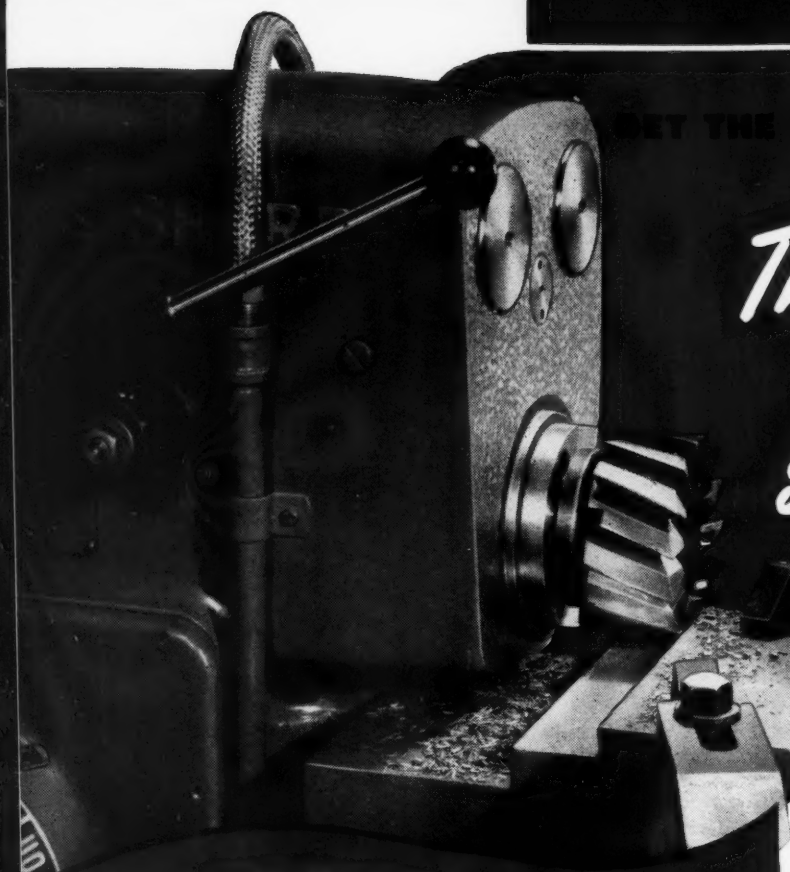
Taylor-Winfield Tri-Phase Welder

The Taylor-Winfield Corporation, Warren, Ohio, is now producing a line of welders with three-phase balanced power designed to give a high power factor of 95 per cent at greatly reduced power demand and to thus help overcome power supply difficulties. These new "Tri-Phase"



"Tri-Phase" Welder Built by Taylor-Winfield Corporation

To obtain additional information on equipment described on this page, see lower part of page 216.



The New 5 HORSEPOWER SPINDLE DRIVE...

FEATURING

THE EXTENDED SPINDLE FACE

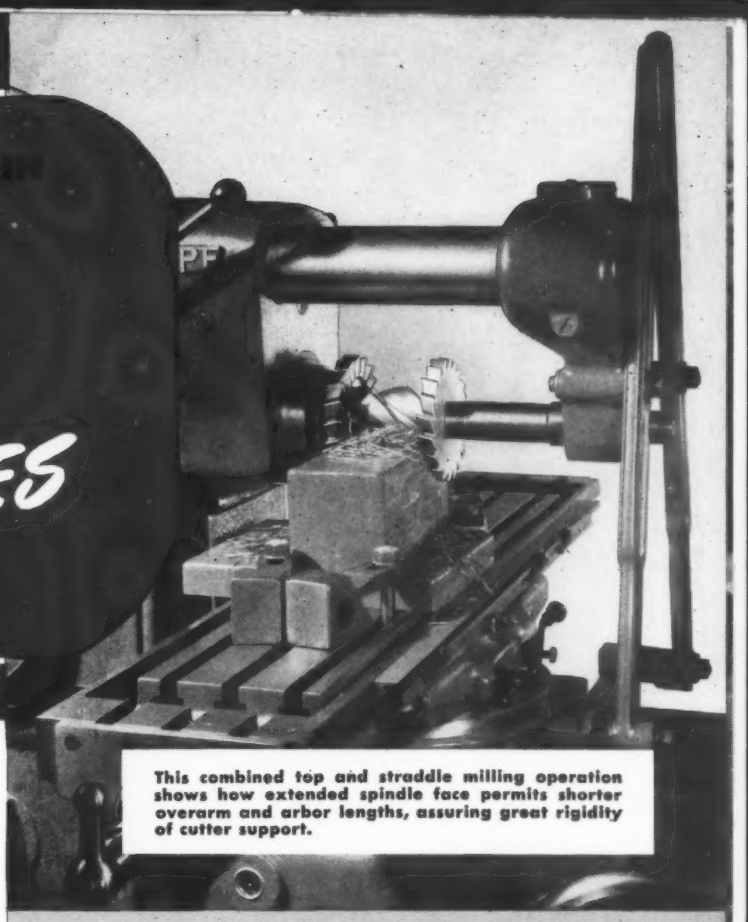
This exclusive feature offers 8 advantages:

- **Greater rigidity of cutter support.** Front spindle bearing is nearer center of table. Overarm and arbor lengths between supports are reduced . . . minimizing arbor springing.
- **Reduced cutter and arbor vibration and cutter wear** because cutters are mounted closer to spindle nose.
- **Reduced cutter costs,** both initial and operating. Extra sturdy arbor support permits use of smaller arbors, using smaller diameter (less expensive) cutters.
- **Greater production** because smaller cutters feed faster at same surface finish.
- **Shorter run-in** required by smaller diameter cutters reduces the length of feed and minimizes non-cutting time.
- **Convenient location of table** . . . work always near operator—less reach.
- **Added clearance for work and fixtures.** Spindle nose extends forward approximately 3" from conventional position.
- **Greater rigidity of attachments** without loss of throat distance.

BROWN &

ADVANCED ENGINEERING DESIGN IN

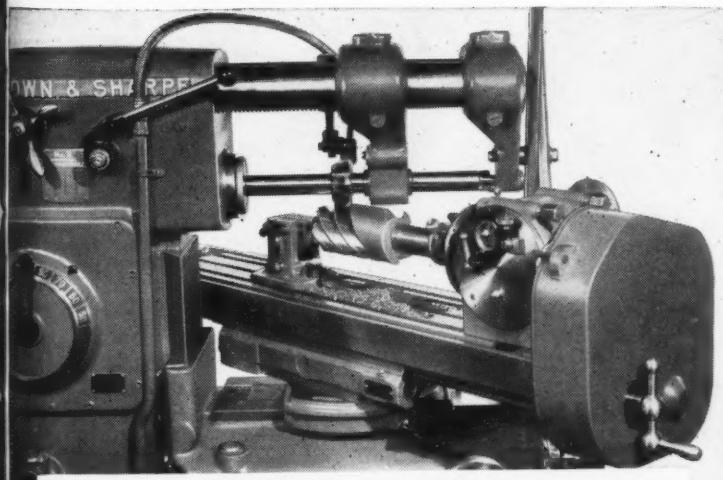
..No. 2 UNIVERSAL and No. 2 PLAIN MILLING MACHINES



This combined top and straddle milling operation shows how extended spindle face permits shorter overarm and arbor lengths, assuring great rigidity of cutter support.

These New Machines embody the same advanced operating features that have proved so efficient and so profitable in the Brown & Sharpe No. 2 Light Type Machines. In addition, they have ample power to take heavier cuts; an increased vertical capacity; a No. 50 milling machine standard taper hole in spindle; suitable speeds for larger cutters; larger overarms and extra rigidity for using greater power. Their advantageously-placed driving motors avoid power loss in the machine.

Investigate the cost-cutting, time-saving features of these new 5 Horsepower Machines for long and short runs. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



This milling operation shows how extended spindle face permits cutting closer to spindle nose with considerable swing of table. Also shows universal spiral index centers with heavy trunnion-type headstock for rigidly supporting work on heavy cuts.

ENGINEERING FEATURES

- Full 5 horsepower drive to cutters—all gear drive, eliminating clutch, belts, chains and sprockets.
- Independent all gear drive to cutting feed and fast travel movements. Driven by ¾ H.P. motor synchronized with spindle motor. Fast travel available with spindle rotating or stopped.
- 18 changes of spindle speeds, 30 to 1200 R.P.M. Power imparted to spindle at all speeds directly back of front bearing mounting.
- 18 changes of cutting speeds in useful range of ½" to 20¼" per minute, uniform in all directions.
- Fast travel, 75" per minute in *all* directions.
- Coolant system operated by ¼ H.P. motor-driven Centrifugal Pump—automatically stops when spindle stops. Disconnected by switch when not required.
- Full automatic lubrication—column, knee, table, saddle and slides.
- Electrical controls conform to MTE standards.
- CAPACITY: Longitudinal feed 28"; transverse feed 10"; vertical feed, 16½".

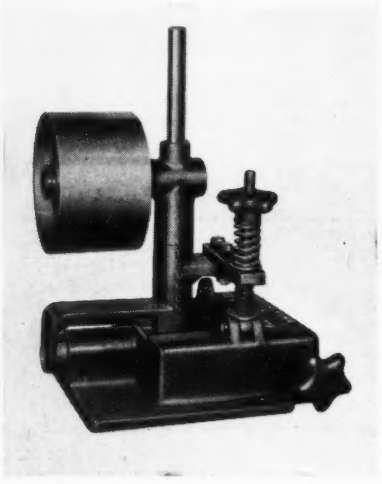
SHARPE

B·S

welders are adapted for welding a great variety of materials, including low-carbon steel, stainless steel, aluminum alloys, magnesium alloys, Monel metal, and brass alloys. They are available in spot, seam, projection, and upset-butt types. 86

Hammond Bench Back-Stand for Abrasive Belts

Hammond Machinery Builders, Inc., Department GP-14, 1600 Douglas Ave., Kalamazoo, Mich., has brought out a back-stand with a pulley 8 inches in diameter by



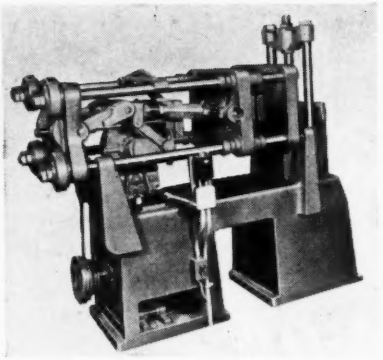
Hammond Bench Back-stand for Abrasive Belts

4 1/2-inch face width, which is designed to take abrasive belts up to 4 inches wide. Although of the same general design and construction as the bench back-stand described on page 202 of November, 1947, MACHINERY, the new stand is of heavier construction and is built for applications requiring a larger back-stand than the previous model.

An adjustable angle bracket designed for mounting the back-stand on wall, ceiling, or floor is available. This bracket is made of steel and has an angular adjustment of 30 degrees. 87

Automatic Die-Casting Machine

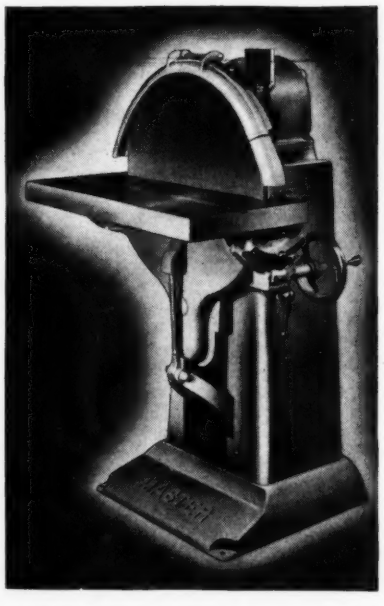
Light Metal Machinery, Inc., 736 Penton Bldg., Cleveland 13, Ohio, has developed a hydraulically operated model of its "Work-



Automatic Hydraulic Die-casting Machine Announced by Light Metal Machinery, Inc.

horse" air-operated automatic die-casting machine. The hydraulic model is larger than the preceding machine, and is designed for the production of zinc, tin, or lead die-castings. It has a "shot" capacity of 32 ounces—twice that of the air-operated machine.

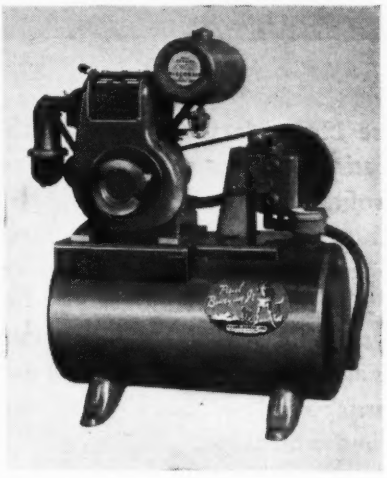
The new machine has a maximum speed of 720 "shots" per hour, but it can be operated at speeds of 520, 340, or 240 "shots" per hour. The casting cycle is completely automatic. Die movement, "shot," and ejection of the die-casting follow smoothly in continuously repetitive cycles. Once the operator adjusts the speed of the machine, it maintains a regular hourly output. No special skill is required to operate the machine, it only being necessary to keep the melting pot filled with metal and the die lubricated.....88



"Master" Disk Grinder Brought out by the Kindt-Collins Co.

Hydraulic Power Unit Equipped with Gasoline Engine

A gasoline-engine equipped power unit, known as the "Paul Bunyan, Jr.," which can be taken to the job wherever it is located, has been brought out by the Hydro-Power Division of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This unit is capable of supplying three gallons of oil per minute at a pressure of 1000 pounds per square inch. The precision-built gear pump is mounted integrally with the operating valve, which has a ball-handle



Hydraulic Power Unit with Gasoline-engine Drive

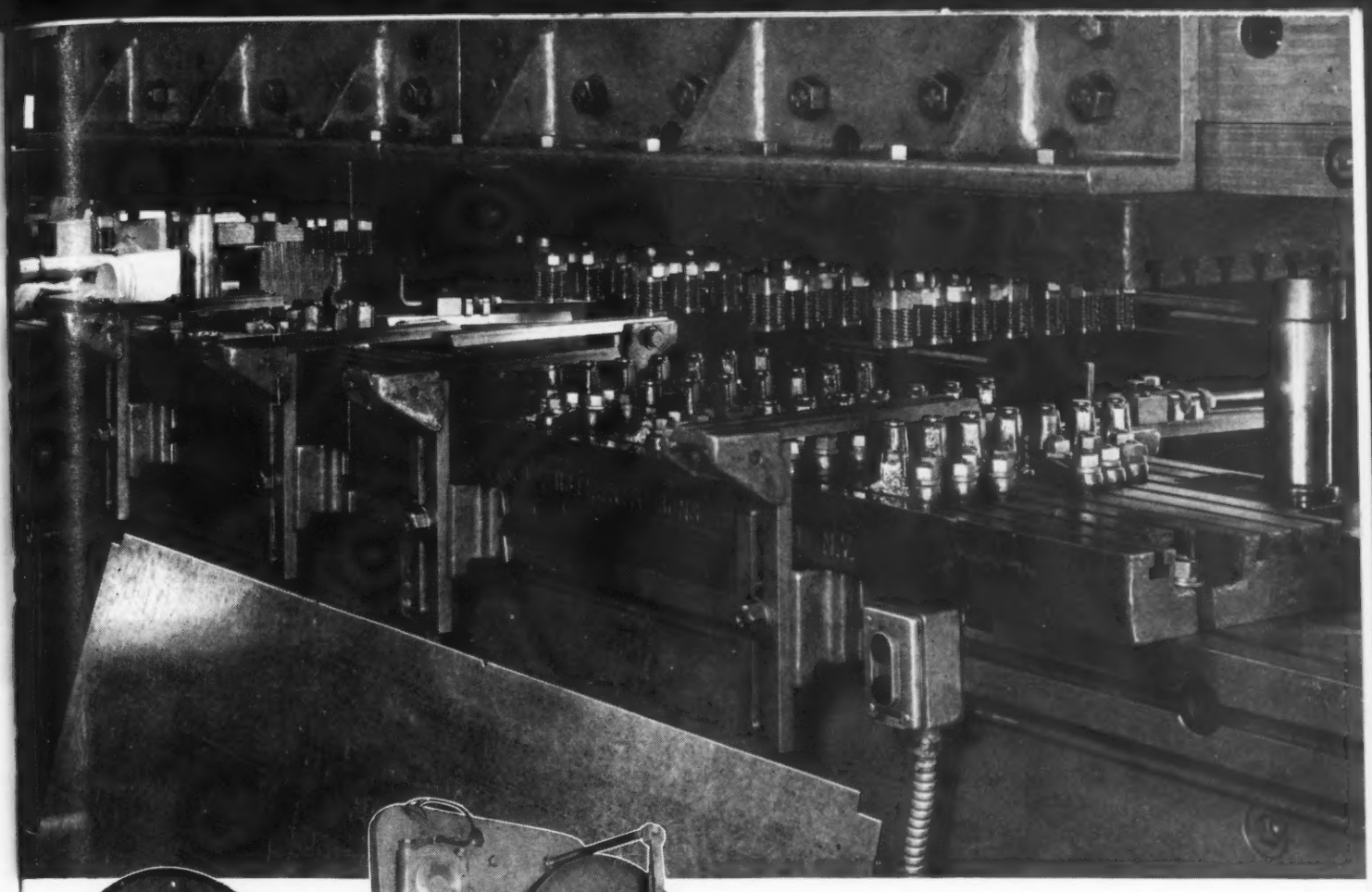
control lever with forward, neutral, and reverse operating positions.

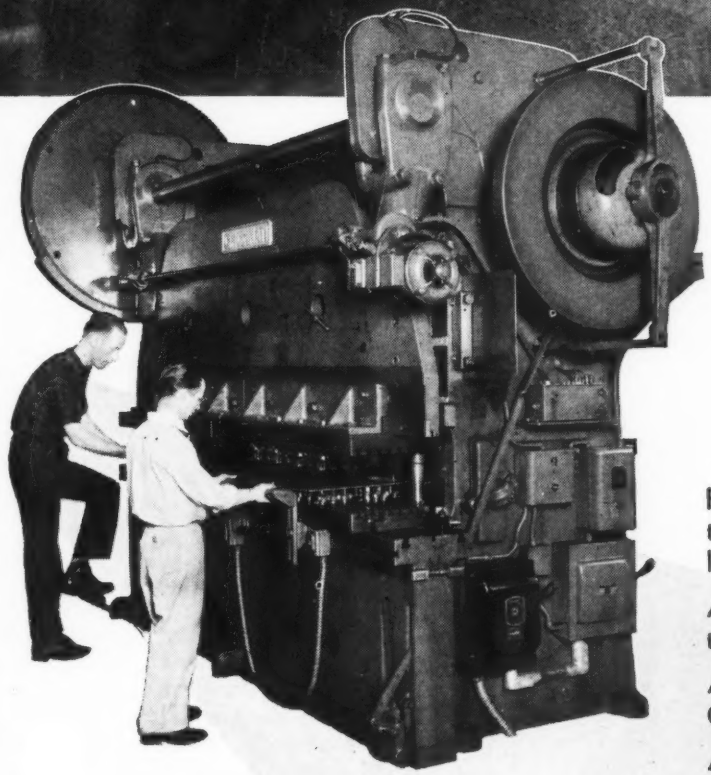
Check and relief valves are built into the main valve body of this unit. Only two operating line connections need be made to make the unit ready for service. The space occupied is 16 by 28 by 36 inches. 89

"Master" Disk Grinder

The Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio, has brought out a new "Master" disk grinder for sanding or grinding metal, wood, or plastic materials. The grinding disk is 24 inches in diameter and is driven by a motor through multiple V-belts. The motor is of the 2-H.P., 220- to 440-volt, three-phase, 60-cycle type, and runs at 1725 R.P.M. The disk is balanced to eliminate vibration and insure

To obtain additional information on equipment described on this page, see lower part of page 216.





● *Courtesy* . . . KIRK & BLUM, Cincinnati, Ohio

72 HOLES

where they belong

Holes must line up—or assembly bogs down. Seventy-two holes are punched in this 10-gauge sheet, accurately located by Cincinnati standard micrometer gauges.

Accurate hole spacing—accurate hole position—are maintained, and assembly is smooth and trouble free.

As production machines, or as machines for jobbing work, Cincinnati Press Brakes are highly profitable.

As a press, they offer high production with low investment. As a Press Brake, their low set-up costs, quick change-overs and versatility bring profits.

Write for Catalog B-2A for complete description of the extensive line of Cincinnati Press Brakes, with many illustrations of the diversified uses of these machines.

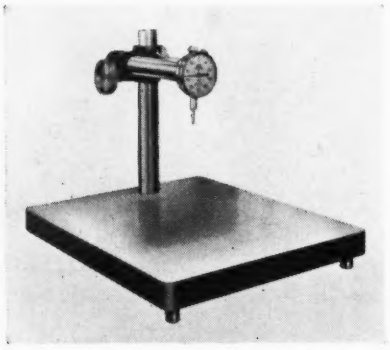
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

grinding the work to a high degree of accuracy.

The counterbalanced table is 13 by 30 inches, can be easily moved vertically through a range of 11 inches by hand pressure, and can be locked in any desired position. It can also be tilted 30 degrees upward and 45 degrees downward. The direction of rotation of the disk can be reversed to accommodate either right- or left-hand jobs. A hole in the back of the machine permits attaching the hose of a suction or dust collector system. The machine weighs approximately 900 pounds. 90



Heavy-duty Dial Comparator

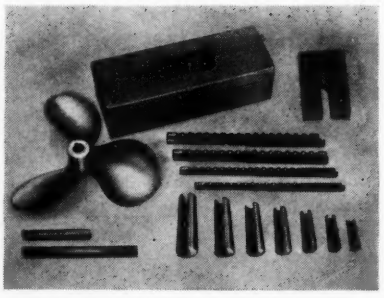
Ames Dial Comparator

The B. C. Ames Co., Waltham 54, Mass., is now manufacturing a heavy-duty precision dial comparator, designated No. 130, which is especially adapted for checking comparatively heavy parts, such as large-diameter shafts and solid blocks having large cross-sections. The rigid construction of the gage also makes possible general dimension checking of light-weight parts, as well as heavy parts, with extreme accuracy.

The comparator is usually furnished with an Ames Model No. 202 lift-lever dial indicator having 0.001-inch graduations reading from 0 to 100 and an indicator range of 0.250 inch. However, any size or range of the "Hundred Series" indicators can be supplied. The base is available in any desired size, and with an upright post of any specified length. 91

Keyway Broaching Kit

The du Mont Corporation, Greenfield, Mass., has announced an addition to the line of "Minute Man" keyway broaching kits for hand cutting of standard width



Keyway Broaching Kit Brought out by the du Mont Corporation

and depth keyways in marine propellers. This kit consists of a set of precision broaches (one for each standard width keyway), slotted taper bushings to fit the propeller bores, extension shanks, shims, and a tapered baseplate, furnished in a hard wood case.

In using these tools, the bushing is inserted in the propeller bore, after which the broach is placed in the bushing slot and pressed through on an arbor press. 92

M. & N. Hydraulic Press

A laboratory type hydraulic press of 30 tons capacity which is designed especially for production work on small parts has been brought out by the M. & N. Machine Tool Works, Inc., 157 Orono St., Clifton, N. J. The new press is of all-steel construction, and is completely self-contained. The upper opening of this press is electrically heated and the temperature is thermostatically controlled up to 450 degrees F. by six cartridge type 250-watt elements, while the lower platen is water-cooled. This unit is also available without the hand pump for use on existing accumulator or motor-driven systems. Steam platens are available if desired. The ram is 5 inches in diameter and has a stroke of 6 inches. The height of the openings is 3 inches, and the operating pressure is 3000 pounds per square inch. The press is 42 inches high and weighs 400 pounds. The bench space required is 16 by 12 inches. 93

Laboratory Type Hydraulic Press Built by the M. & N. Machine Tool Works, Inc.

Stow "Lightning" Flexible-shaft Machine

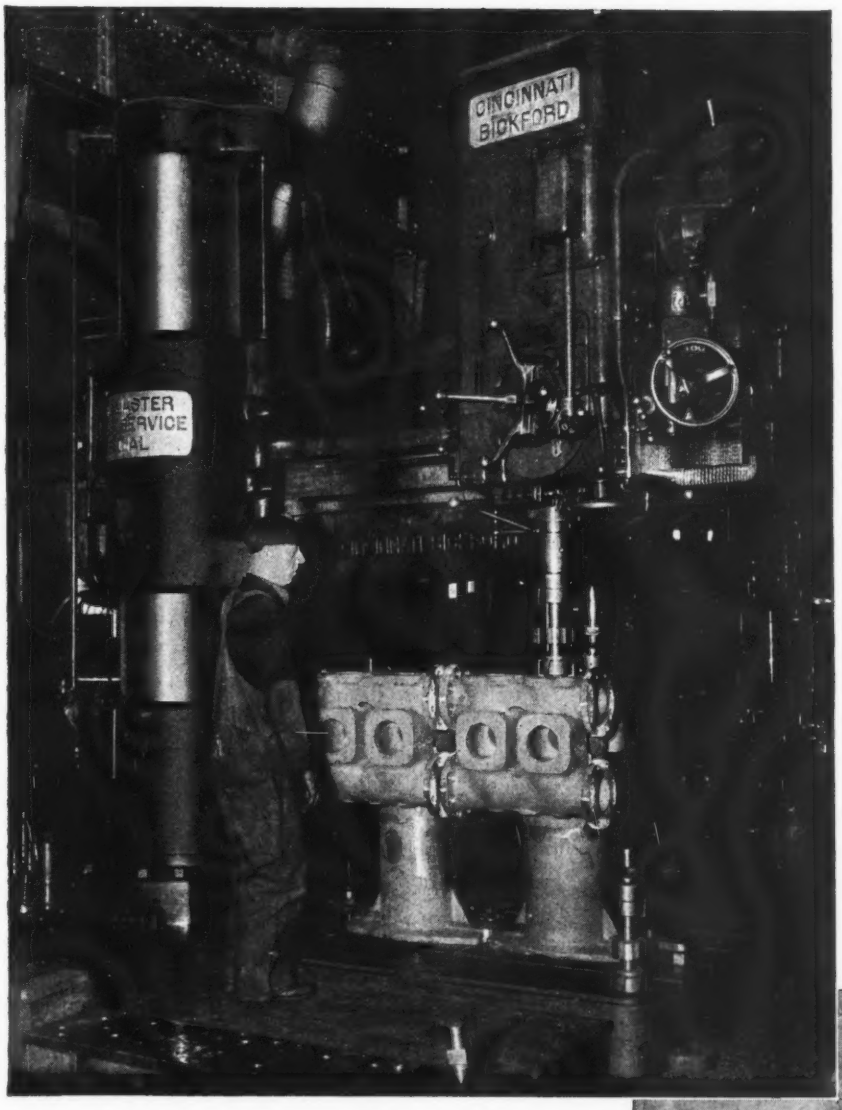
"Lightning" Light-Duty Flexible-Shaft Machines

The Stow Mfg. Co., Binghamton, N. Y., has brought out a line of light-duty portable flexible-shaft machines known as "Lightning." The machines in this line are intended for use in repair, welding, and sheet-metal shops, and will supersede the company's former J line.

The new machines are made in two models, with 1/4- and 1/2-H.P., 110-volt alternating-current, 60-cycle, single-phase motors operating at speeds of 1725 and 3450 R.P.M. High pedestals are employed to facilitate both bench and shop work. The two models are equipped with either 5- or 6-foot flexible shafts having a 3/8-inch diameter core in a 15/16-inch casing. The shafts are designed to drive buffers, grinders, drills, or wire brushes. 94

To obtain additional information on equipment described on this page, see lower part of page 216.

THE master OF THE JOB ...



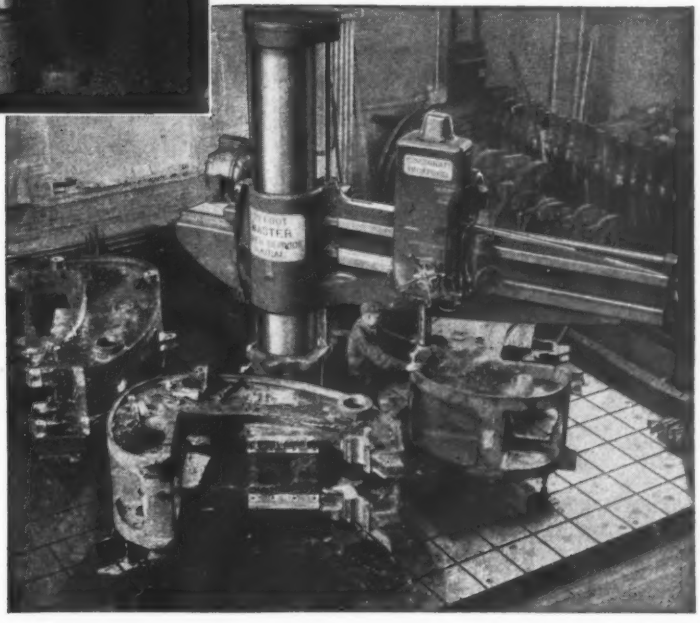
For the really big job, Cincinnati Bickford Master Super Service Radial Drills—the largest and most powerful radial drills built—give outstanding service.

Forty horse power, constant speed driving motor—spindle speeds from 12 to 1200 r.p.m., or from 6 to 600 r.p.m., insure efficient drilling or boring of holes from ¼" to 16" in diameter.

Very large, heavy castings are handled on these Master Super Service Drills—with their 7' to 12' arm and their 22" to 26" diameter columns. The operator controls these massive Radial Drills with ease—all operating levers being centralized low on the head.

o

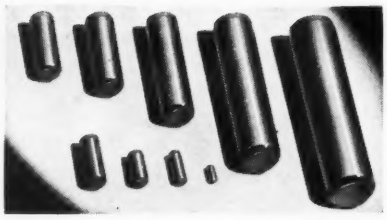
If your job requires unusual power, rigidity and capacity in the machine, write for Circular R-22 on the Cincinnati Master Super Service Radial Drills—the masters of the job.



RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**



Holo-Krome Dowel-pins with Black Rust-resistant Finish

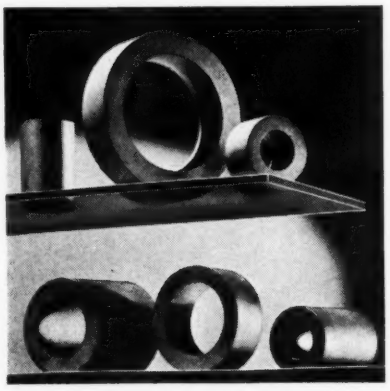
Holo-Krome Dowel-Pins with Rust-Resistant Finish

The Holo-Krome Screw Corporation, Hartford 10, Conn., has announced a line of dowel-pins having a black luster finish developed to serve as a lubricant, retard corrosion, and prevent rust. The lubricating quality of the finish allows these pins to be driven more easily and greatly lessens the danger of scoring both the pins and the parts in which they are used.

The pins are made of Holo-Krome special alloy steel, hardened, carburized, and rough- and finish-ground, after which the special black luster finish is applied. Each dowel-pin is given a thorough inspection. The pins are available in a complete range of standard sizes, and special sizes can be furnished to order...95

Carbide Bushings

A new line of all-purpose carbide bushings which can be used as wear-resistant parts where either the inside or outside dimension is critical has been announced by the Carboloy Company, Inc., 11147 E. Eight Mile St., Detroit 32, Mich. These bushings are available in two general size classifications. One group ranges from 1/8 to 1/2 inch in length, 1/16 to 1 inch inside diameter, and 1/8 inch to 1 3/8 inches outside diameter. Bushings in the second group range from 7/8 to 1 inch in length, 3/8 inch to 2 3/8 inches



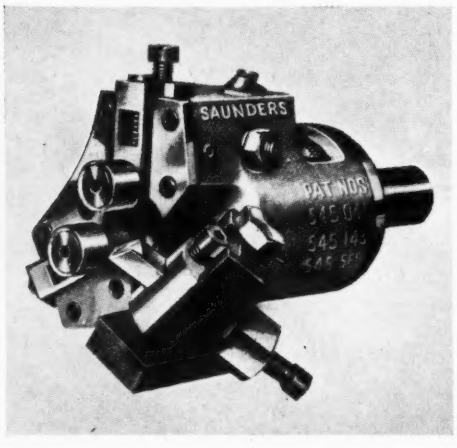
All-purpose Carbide Bushings

inside diameter, and 11/16 inch to 3 inches outside diameter. The bushings in the second group are applicable for making thread plug gages and for a variety of guide bushings. The smaller sizes of bushings in the first group are regularly made from Carboloy Grade 883, while the larger sizes in this group and all sizes in the second group are made from Carboloy Grade 44A. 96

Saunders Roller Box-Tool

The International Trade Relations Agency, Inc., Industrial Division, 832 Washington Bldg., Washington 5, D. C., has introduced on the American market a roller box-tool of the design shown in the illustration. This tool, patented and produced by the Saunders Tool Co., in Great Britain, is now available in two models: Model No. 1 has a 1-inch shank, a cutting range of 1/4 to 1 inch, and a weight of 8 pounds; while Model No. 2 has a 3/4-inch shank, a cutting range of 1/8 to 3/4 inch, and a weight of 3 pounds.

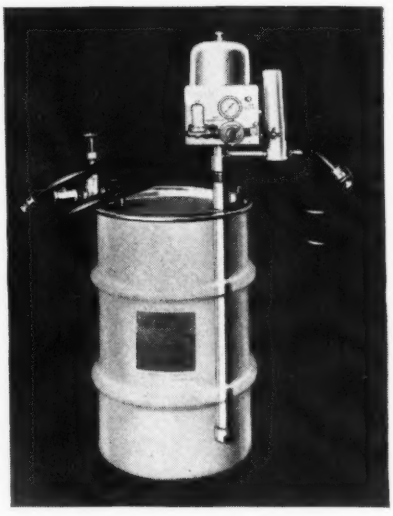
Outstanding features of this roller box-tool include spring compensators designed to insure uniform application of roller pressure on work in order to eliminate irregularities such as often result from hand operation; double-row ball-bearing rollers for maintaining efficiency without attention, and which, when once set for one diameter, are uniformly adjusted for all diameters; self-centering and self-aligning arrangement which rectifies any error in the machine and eliminates distortion; and a toolpost with tangent tool designed to simplify adjustments in all directions. 97



Saunders Roller Box-tool Placed on the American Market by the International Trade Relations Agency

Air-Operated Pump for "Siefen System"

The J. J. Siefen Co., 5657 Lauderdale, Detroit, Mich., has added an air-operated pressure pump to the "Siefen System" for spraying buffing and polishing compounds on revolving wheels. This air-operated positive-pressure pump,



"Siefen System" Equipped for Spraying Buffing and Polishing Compounds on Wheels

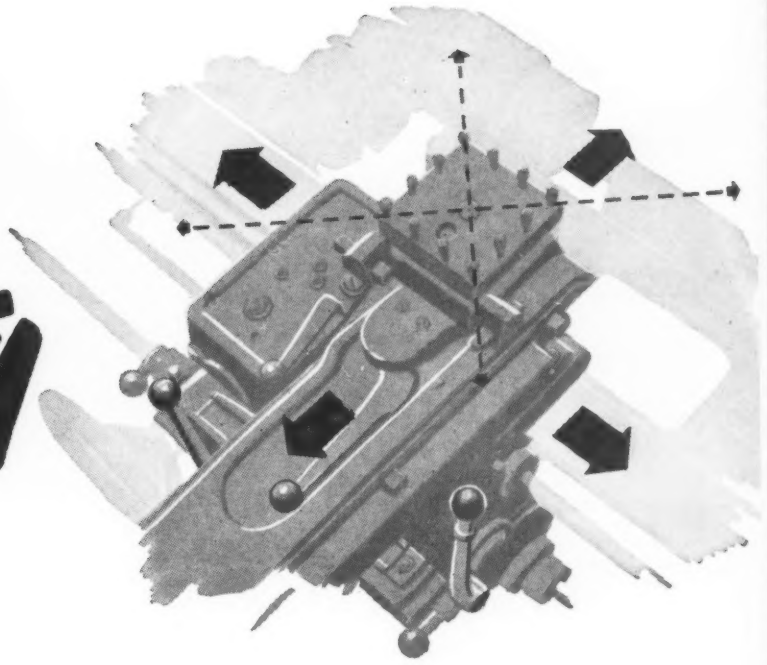
together with the return-line hose, air-pressure regulators for controlling the fluid pressure, surge chamber, compound-line hose leading to spray guns, positive-pressure piston, and accessories, is shown assembled with a 30-gallon compound drum.

The air-operated pressure pump furnishes compound to the spray guns, circulates it, and returns it to the drum, thus assuring sufficient compound at all times for each gun, as well as providing a means for mixing the materials in the drum. 98

To obtain additional information on equipment described on this page, see lower part of page 216.

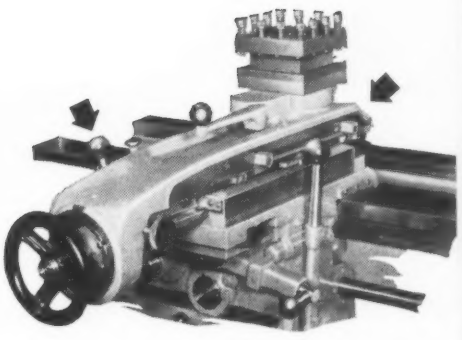
GISHOLT Saddle Type TURRET LATHE

Exclusive Versatility

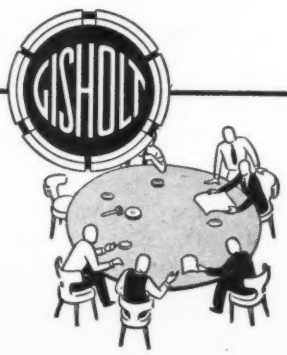


Power Rapid Traverses for side carriage and cross slide are controlled by dual levers, thus permitting them to move independently or together.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin



Gisholt's more versatile power rapid traverse reduces time lag between cuts, speeds production, saves time and money. *This has been a standard Gisholt feature for over twenty years.*



THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS BALANCERS • SPECIAL MACHINES

Fig. 1. B & S Closer for Self-opening Die-heads

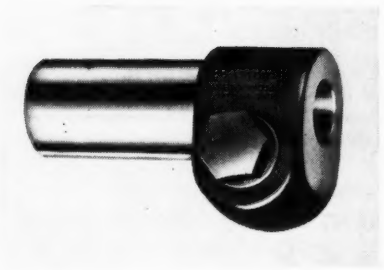


Fig. 2. Brown & Sharpe Turret-tool Adapter

Brown & Sharpe Screw Machine Tools

The Brown & Sharpe Mfg. Co., Providence 1, R. I., has recently added a closer for opening type die-holders, turret-tool adapters, and revolving stock stops for turrets to its line of screw machine tools. The new No. 200 closer for opening type die-holders, shown in Fig. 1, can be used on the Nos. 00, 0, and 2 automatic screw machines. This closer has longitudinal adjustment to permit correct positioning for operating the lever of the self-opening die-head as the turret indexes and the arm on the die-head comes in contact with the die closer. Provision is made for attaching the closer to the front of the bed of the machine.

The new turret-tool adapter, shown in Fig. 2, is made in a No. 20-00 model to permit the use of No. 00 size tools on No. 0 size automatic screw machines; a No. 22-00 model to permit No. 00 tools to be used on No. 2 automatic screw machines; and a No. 22-20 model to permit No. 0 tools to be used on No. 2 machines.

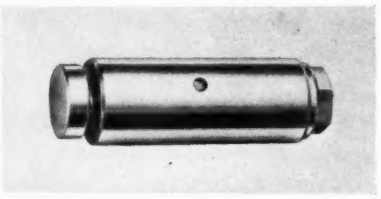


Fig. 3. Revolving Stock Stops Made by Brown & Sharpe

Revolving stock stops such as shown in Fig. 3 are available in long and short types which can be mounted in the turrets of automatic screw machines for positioning the end of the stock at a specified distance from the collet nose. These stops have hardened and ground heads, the thrust being taken by a ball, which allows free rotation of the head and thus prevents marring the end of the work. The stops are made for use in all sizes of automatic screw machines from No. 00 to No. 2. ..99

Mead Impact Hammer with Universal Base and Rotary Work-feeder

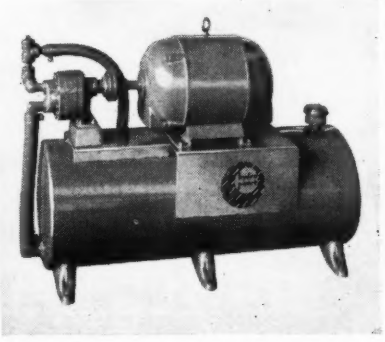
Mead Impact Hammer and Rotary Work-Feeder with Universal Base

The Mead Specialties Co., Department H-26, 4114 N. Knox Ave., Chicago 41, Ill., is providing its impact hammers with a new heavy-duty cast-iron base as shown. The new base is 12 inches wide by 17 inches long by approximately 2 inches thick, and weighs 70 pounds. It has a precision ground surface for supporting fixtures, and when mounted on an ordinary bench, has ample "anvil effect" to take the blow of the impact hammer.

In the set-up illustrated, the hammer is actuated by the auxiliary valve on the left side of the rotary work-feeder mounted on the table. This valve opens at the moment the dial locks in position, thus assuring accurate synchronization. The valve closes as soon as the indexing pawl starts back for a new station indexing movement, giving the hammer ample time to reset for the next blow. This hammer is capable of operating at 5000 cycles an hour.....100

Hydraulic Power Units

A new series of "packaged" hydraulic power units has been designed by the Hydro-Power Division of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. These power units, known as the "Cubline," which sell in the low-price bracket, have been developed to open up broader fields for the application of hydraulics in forming, bending, straightening, pressing,



"Cubline" Hydraulic Power Unit Built by Hydraulic Press Mfg. Co.

lifting, pulling, and lowering. They are comparatively small in size, and therefore require little mounting space.

The new power units are available in three capacities of 6, 10, and 15 gallons per minute. The two smaller units are 46 inches long, 18 1/4 inches wide, and 32 inches high. Each power unit includes a 35-gallon oil-storage reservoir; an electric motor; and a gear pump having a capacity of 1000 pounds per square inch...101

Bare Bronze Wire for Submerged-Arc Welding

A bronze bare wire called "Ampco-Trode 10" which is especially adapted for overlaying large steel bearing areas to provide long-

To obtain additional information on equipment described on this page, see lower part of page 216.

wearing and corrosion-resistant surfaces or for joining aluminum-bronze parts by the submerged-arc process has recently been developed by Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4, Wis. This wire is furnished in coils, with wire diameters of 1/8 and 3/16 inch. 102

Fig. 1. Sensitive Precision Levels Introduced by the Engis Equipment Co.

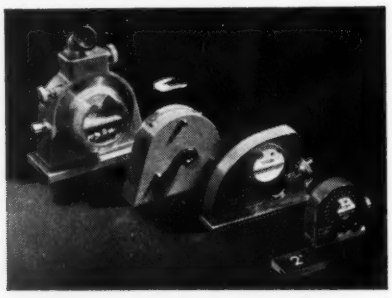
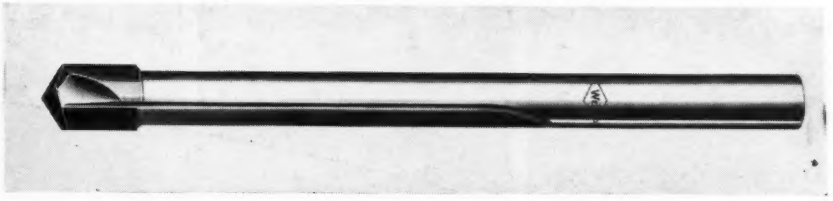


Fig. 2. "Clinometers" for Precision Checking of Angles or Inclined Surfaces

Sensitive Precision Levels and Angle-Checking Instruments

A line of sensitive precision levels of the type shown in Fig. 1 has been introduced by the Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill. These levels are designed to meet a great variety of sensitivity, accuracy, and form requirements. They can be used for checking vertical and horizontal planes or incorporated in other equipment.

This company has also placed on the market a line of instruments for determining and checking angles or inclined surfaces. These "Clinometers," as shown in Fig. 2, range from pocket-size to large instruments. 103



Carbide-tipped Die Drill Made by Whitman & Barnes

Whitman & Barnes Carbide-Tipped Die Drills

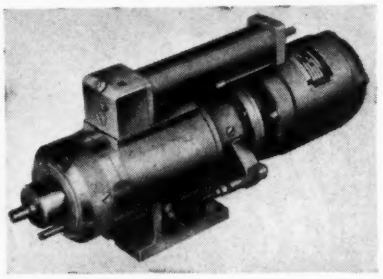
Carbide-tipped drills capable of drilling steel in a hardness range of from 40 to 65 Rockwell C have been announced by Whitman & Barnes, 2108 W. Fort St., Detroit 16, Mich. These tools are made for drilling hardened dies without annealing, and can be used for cutting through hard outer cases, as well as for drilling parts after hardening. Difficulties arising from distortion of drilled parts during heat-treatment can be eliminated by performing the drilling operations with these new drills after the parts have been hardened.

These die drills have a specially designed point with the proper negative rake to prevent chipping and to dissipate heat. The shank is of high-speed steel, and the carbide tip is of sufficient length to permit many regrinds. The drills are made with diameters of from 3/32 to 3/4 inch, varying in steps of 1/32 inch. 104

Cleveland Republic Air-Hydraulically Operated Power Unit

Production drilling can be done in any position by an air-hydraulically operated power unit recently developed by the Cleveland Republic Tool Corporation, 1265 Union Commerce Bldg., Cleveland 14, Ohio. This drill unit is made in two models. It can be used singly or can be combined with several units for simultaneous operations.

One model can be used to drill 1/4-inch holes in steel, while the other is suitable for drilling holes up to 1/2 inch in diameter in steel. The units can also be employed for milling, riveting, chamfering, slot-sawing, and spot-facing operations. They can be provided with hand, foot, semi-automatic or fully automatic controls to suit requirements. 105



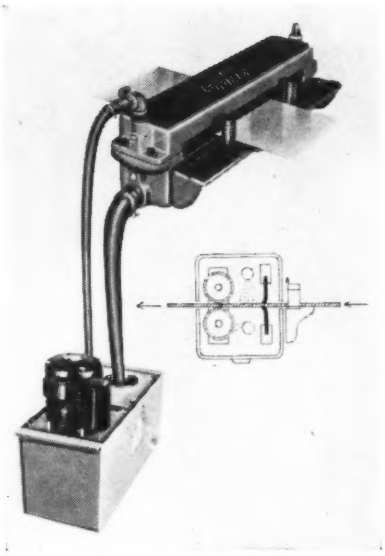
Air-Hydraulically Operated Power Unit Brought out by the Cleveland Republic Tool Corporation

LaBahn Stock Reels

A completely new line of stock reels and scrap winders has been added to the line of automatic roll feeds, stock straighteners, and scrap cutters manufactured by the LaBahn Machine & Mfg. Co., Menlo Park, N. J. More than twenty-five different models are included in this new line. A self-centering feature is available on most models. Capacities range from 150 to 1000 pounds. The reels can be tilted from the vertical to the horizontal. 106

Stock Reel Added to the Line of LaBahn Machine & Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 216.

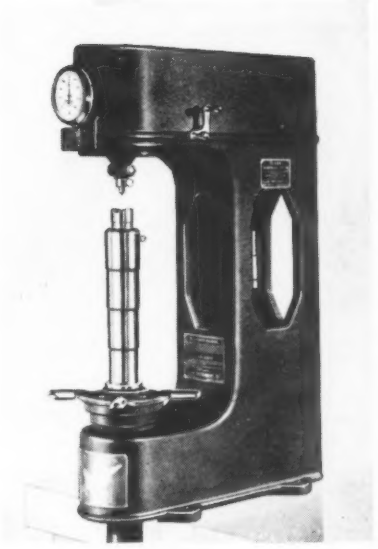


Stock-Oiling Unit for Punch Presses

Stock-oiling unit for punch presses consisting of compact force-feed lubricator and pumping unit. Made in three sizes to handle stock widths of 6, 12, and 24 inches. Will accommodate stock up to 3/16 inch in thickness. Lubricant pumped into the oiler sprays both the top and the bottom surfaces of the stock. Built by Graymills Corporation, Evanston, Ill. 107

Clark Hardness Tester

Clark superficial hardness tester, available in three models with 8-, 12-, or 16-inch vertical capacity. Designed for "Rockwell" testing of surfaces that must not be marred by the standard "Rockwell" indentation. Suitable for testing hardened steel, exceptionally thin sheet metal, rolled sheet metal, or very small areas. Depth of penetration of specially formed lapped diamond cone penetrator is held to limits of 0.005 inch or less. An improved Clark "C" diamond penetrator which fits all makes of hardness testers for standard "Rockwell" testing and a Clark "S" diamond penetrator which fits all machines for superficial "Rockwell" testing are also new developments. Announced by Clark Instrument, Inc., 10200 Ford Road, Dearborn, Mich. 108

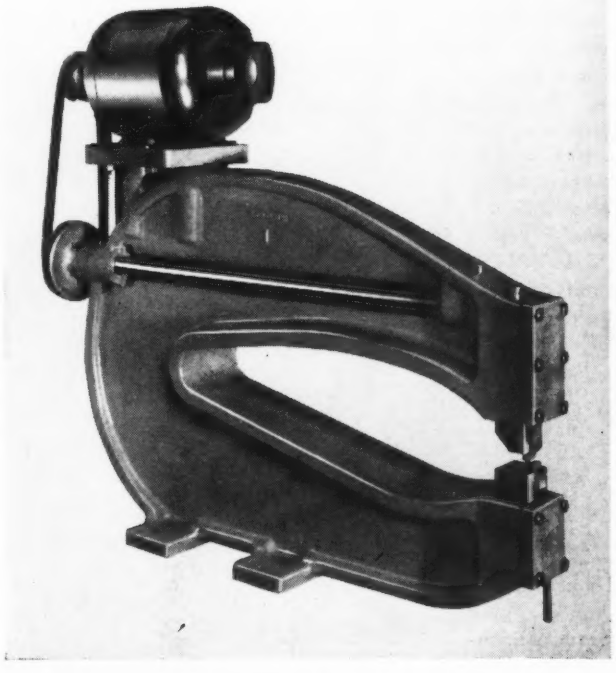


High-Speed Bench Shear

High-speed bench shear known as the "Nib-Shear," which is designed for rapid cutting of sheet metal to any desired shape. This machine has a capacity for cutting out openings in 14-gage mild steel or 16-gage stainless steel to a 1-inch radius within an area accommodated by its throat depth of 18 inches. The shear is driven by a 1/3-H.P. motor. It is 28 1/2 inches long, 25 1/2 inches high, and weighs 172 pounds. Placed on the market by H-A Mfg. Co., Box 346, York, Pa. 109

Ozalid Print Production Machine

Ozalid Division of General Aniline & Film Corporation, Johnson City, N. Y., announces a new "Super-B" machine designed to produce "Ozaprints" at speeds up to 25 feet per minute. Its operation is continuous, with exposure and dry development combined in one automatic process. Accommodates materials up to 42 inches wide. The machine operates on 23 1/2 amperes at 220 volts and requires a starting current of 30 amperes at 220 volts. It is 84 1/2 inches wide, 79 inches high, and 38 inches deep. 110



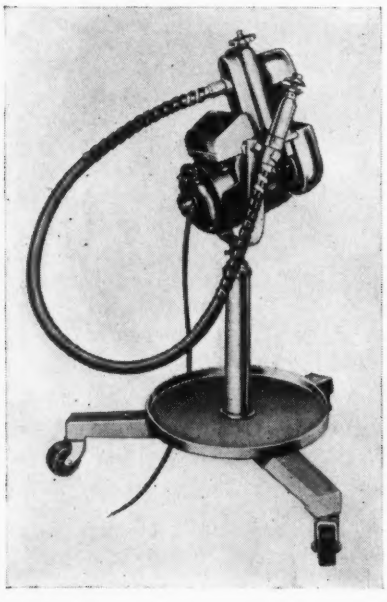
To obtain additional information on equipment described on this page, see lower part of page 216.

"Eagle" Electric Drill Kit

"Eagle" electric drill kit for light-duty commercial and home craftsman use. Kit includes a 110- to 120-volt motor drill with speed of over 1100 R.P.M., made by Fairchild Industries, Inc.; set of drills in sizes from 1/16 to 1/4 inch; and three-jaw chuck. Placed on the market by Century Drill & Tool Works, 96 Lafayette St., New York 13, N. Y. 111

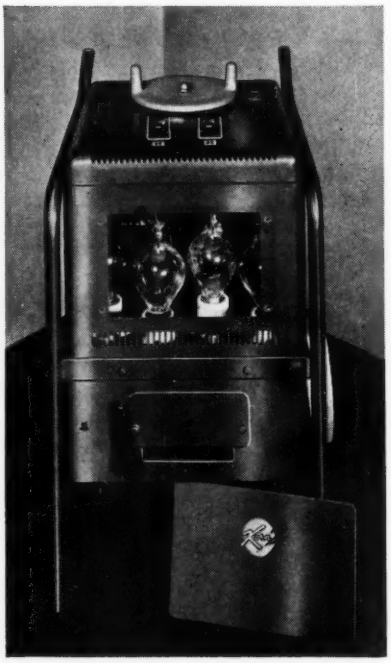
Elliott Flexible-Shaft Machine

Improved Elliott flexible-shaft machine with new type of countershaft mounting designed to provide greater flexibility and reduce strain on workman. Vertical adjustment of countershaft by finger-tip knob control; ball-bearing hand-pieces, countershaft, and motor; welded steel yoke with ball thrust pivot bearing; and simplified controls are features of this machine. A variable-pitch cone pulley can be substituted for the standard three- or four-step cone pulley on the motor shaft to obtain stepless speed adjustment through a ratio of 2 to 1. Made by Elliott Mfg. Co., Binghamton, N. Y..112



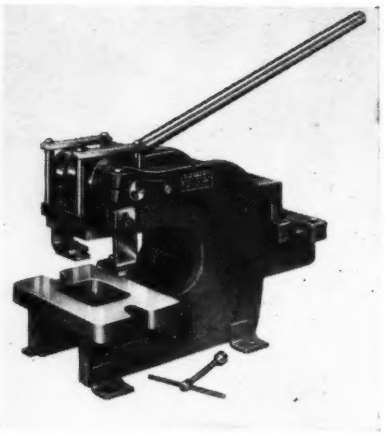
Kern "Dual-Tronic" Welder

Kern "Dual-Tronic" combination welder, which can be adjusted for operation on either direct or alternating current by simply setting two switches and a hand-lever. For direct-current operation, the machine uses rectifier tubes, shown through the panel opening in the illustration. This welder is made in two models, one with 5 to 60 amperes direct-current range and 25 to 200 amperes alternating-current range, and the other with 5 to 90 amperes direct-current range and 25 to 200 amperes alternating-current range. Product of John A. Kern Co., 224 N. Loomis St., Chicago 7, Ill. 113



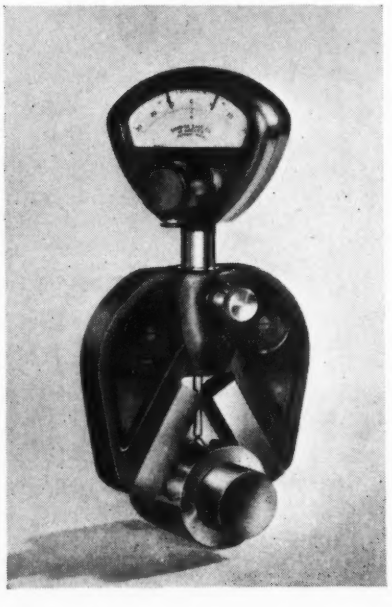
Leslie Large-Capacity Hand Punch Press

Hand-operated punch press of all-steel and welded construction especially adapted for blanking operations. This press accommodates blanking punches ordinarily used on small power presses. The punch-plate is 4 by 4 3/8 inches, the press throat depth 6 inches, and the stroke length 7/16 inch, with an adjustment of 1/8 inch. Holes 3 inches in diameter can be blanked in 16-gage mild steel or 2 inches in diameter in 12-gage mild steel. Introduced by Leslie Welding Co., Dept. QQ, 2943 Carroll Ave., Chicago 12, Ill.....114



"Ridermikrokator" for Checking Cylindrical Work

"Ridermikrokator" instrument made in two frame sizes for checking out-of-roundness and diameters of cylindrical work of from 3/16 inch to 2 3/8 inches in diameter and 2 3/8 to 4 3/4 inches in diameter. Introduced by Swedish Gage Co. of America, 8900 Alpine Ave., Detroit 4, Mich. 115



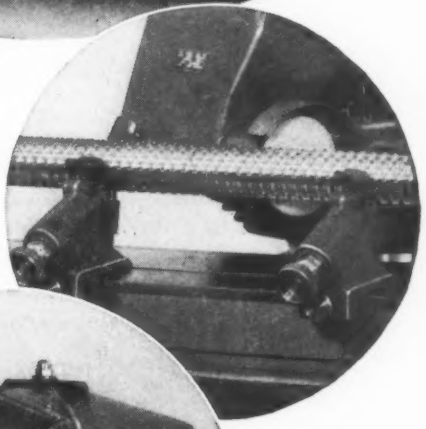
To obtain additional information on equipment described on this page, see lower part of page 216.

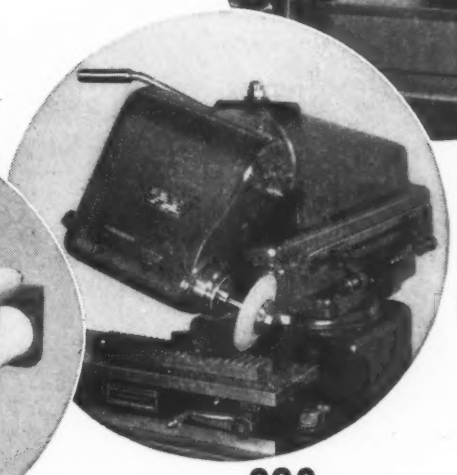
REJUVENATE YOUR BROACHES

TO ORIGINAL CONDITION

(Quick Delivery)

MODEL FS3
FOR
FLAT BROACHES





MODEL RG1
FOR ROUND BROACHES

MODEL CS3
A "UNIVERSAL" SHARPENER FOR BOTH FLAT AND ROUND BROACHES

HOW TO PICK THE BEST BROACH SHARPENER FOR YOUR NEEDS

	You need this Sharpener
If you have only "round" broaches (cylindrical, spline, etc.) up to	
36 in. long	RG1-36
72 in. long	RG1-72
84 in. long	RG1-84
If you have only "flat" broaches (surface broaching)	FS3-36
If you have both flat and round broaches up to	
72 in. long	CS3-72
84 in. long	CS3-84

Ask for complete information by model number

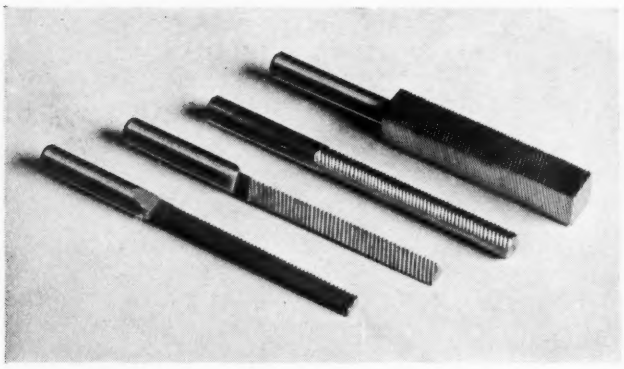
....with one of these Broach Sharpeners by

PIONEERS OF H.S.S. BROACHING

COLONIAL

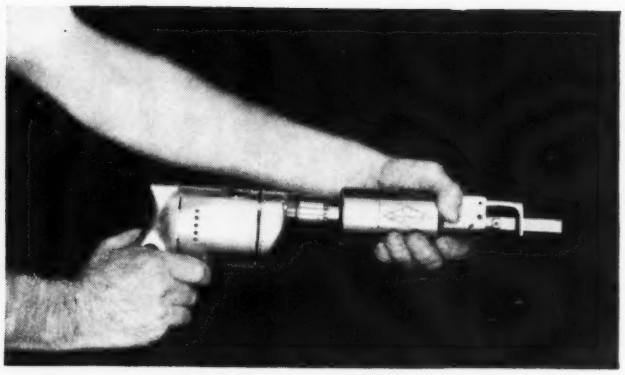
BROACH CO. DETROIT 13

BEST BY TEST



Severance Ground Carbide Files

Ground carbide files which can be used for making alterations or corrections on hardened dies (as hard as Rockwell 63 C) without the necessity for annealing and rehardening. Available in several sizes and in round, square, rectangular, and triangular shapes. Although made primarily for use in die-filing machines, they can be employed manually or applied to any reciprocating device. Made by Severance Tool Industries, Inc., 636 Iowa St., Saginaw, Mich. 116



Sawing and Filing Attachment

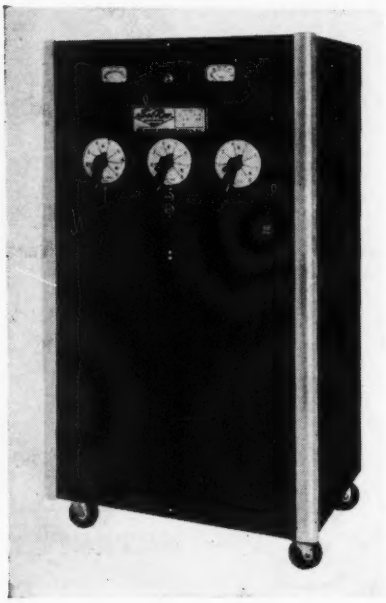
Attachment designed for use on electric or air hand drills and flexible shafts with speeds up to 1700 R.P.M., which quickly converts the standard rotary motion into a 3/4-inch reciprocating motion for sawing, filing, honing, and polishing. This attachment is also adapted for use on small bench or pedestal drills. Placed on the market by V-W Specialists, 35 South 69th St., Upper Darby, Pa. 119

High-Amperage Selenium Rectifier

Selenium rectifier designed to meet the need for an economical direct-current power source for electroplating requirements up to 5000 amperes with varying voltages from 1 to 9. Manufactured by Bart-Messing Corporation, 45 Morgan Ave., Brooklyn 6, N. Y. This unit is particularly adapted for chromium, bright nickel, and acid copper plating, as well as electro-cleaning and electro-polishing. It is protected by safety devices, and the cabinet is mounted on ball-bearing casters. 117

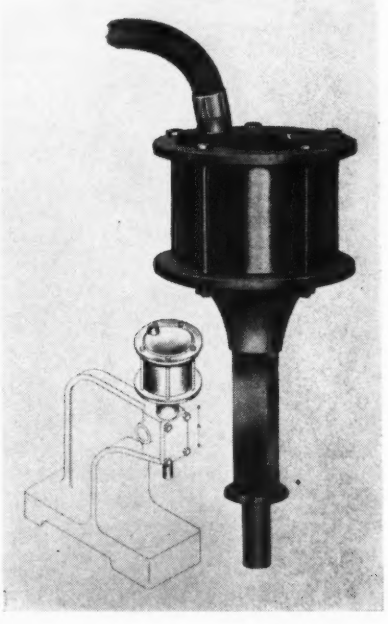
Air Conversion Unit for Arbor Presses

Air conversion unit designed specifically for converting any hand-operated arbor press for air operation. Installed by simply removing ram retainer plate and ram from the hand-operated press and replacing with conversion unit, which is then connected to shop air line. The 3/4-inch ram has a stroke of 2 1/2 inches and a power factor twelve and one-half times that of the air-line pressure. Announced by Paragon Metal Products, 844 W. Adams St., Chicago 7, Ill. 120



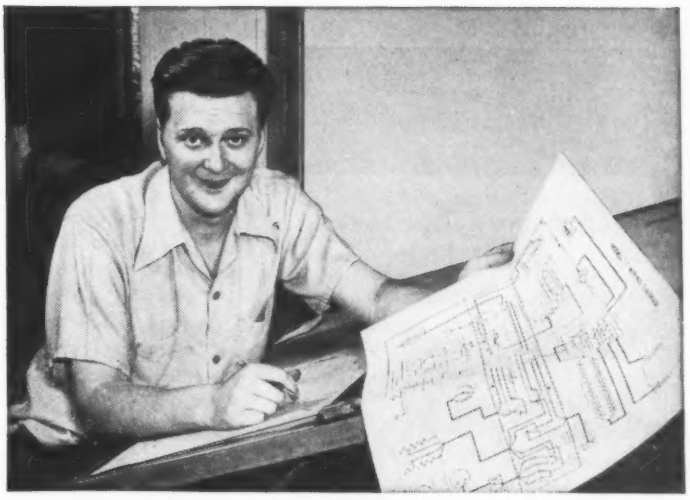
"Metroscope" for Measuring Wall Thicknesses

Ultrasonic device, known as the "Metroscope," which automatically measures wall thickness of metal, plastic, and glass parts where only one surface is accessible, and also makes rapid, nondestructive tests to detect flaws and imperfections in these materials. The thickness of tubes and flat parts between 0.015 and 0.300 inch can be read directly, and thicknesses up to several inches can be read indirectly on this device. Manufactured by Photocon Research Products, 1062 N. Allen Ave., Pasadena 7, Calif. 118



To obtain additional information on equipment described on this page, see lower part of page 216.

A new future for your drawings!



1. Now any of your drawings can be reproduced in black, blue, red, or sepia lines on white or tinted paper. Thus, you can "color code" your prints . . . speed routing . . . eliminate errors.

2. You can always match the job at hand. For example: If grease and grime abound in the shop you can practically eliminate replacements by ordering Ozaplastic prints. These durable prints are oilproof, waterproof—can be cleaned in seconds with a damp cloth.

3. You can improve on your best drawing by ordering Ozacloth or Ozalith translucent "masters." These new materials increase the line densities of your original . . . are plastic-coated . . . oilproof, waterproof . . . turn out Ozalid prints of maximum visual density.

4. New Ozalid Stripfilm—a transparent, adhesive-back material—can be used to transfer title blocks, sections, etc., from one drawing or master copy to another.

Using Ozalid foils, you can combine on *one* print the details of separate, but related, drawings. And new Ozachrome even allows you to make transparent overlays in full color.

Always the same simple operation—Exposure and Dry Development—to produce the desired type of Ozalid print.

And speed? Standard Ozalid prints are produced in 25 seconds—or less! Each a positive copy produced directly from your original drawing.

New Free Booklet!

See all the Ozalid prints you can make . . . and learn specifications of complete line of Ozalid machines. There's *one* for you.

OZALID A Division of General Aniline & Film Corporation
Johnson City, New York

Dept. No. 132

Gentlemen: Please send free booklet of Ozalid prints . . . and machine catalog for all printmaking requirements.

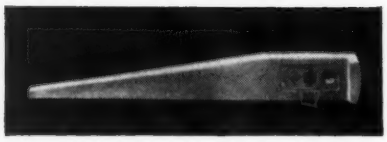
Name_____

Position_____

Company_____

Address_____

Ozalid in Canada—Hughes Owens Co., Ltd., Montreal



Cleveland Improved Drill Drift

Drill drift with shouldered head designed to lessen mushrooming and damage to babbitt hammers and to prevent drift from flying through spindle slot and injuring a worker when removing tapered-shank drills. Made by Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio. 121

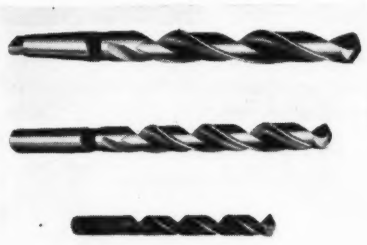
Pillow Blocks with Porous Bronze Bearings

Pillow block of rigid cast-iron construction, with thrust faces and mounting surfaces accurately machined to facilitate installation

from specifications. Lubrication by capillary action of the porous bronze bearing. Available in six shaft sizes ranging from 1/2 to 1 inch. Manufactured by the Precision Products Co., 815 Pryor St., S.W., Atlanta, Ga. 122

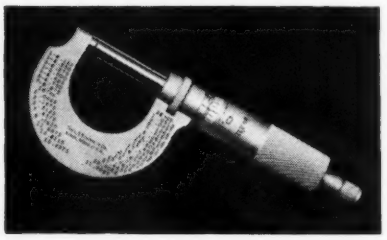
"Life-Line" Induction Motor

Wound-rotor "Life-Line" induction motor of open drip-proof construction, brought out by Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa., in ratings of 1 to 15 H.P. and in frame styles ranging from 203 through 326. The adjustable spring tension brushes of these motors are made of electro-graphite or metal graphite, depending upon service requirements. Provided with self-sealed, pre-lubricated ball bearings. These motors can be used wherever adjustable speed is required or where high starting torque with low starting current is necessary. 123



Carbide-Tipped Drills with Taper Shanks

The Super Tool Co., 21650 Hoover Road, Detroit 13, Mich., is now furnishing its standard line of carbide-tipped twist drills with taper shanks. The taper-shank drills are available in the same sizes as the straight-shank drills, which range from 1/8 to 1 inch in diameter. 124

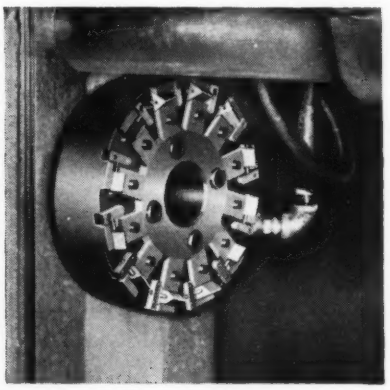


Starrett "Satin-Chrome" Finish Micrometers

Micrometers made by the L. S. Starrett Co., Athol, Mass., including the friction-thimble and black-frame models, are now furnished with "Satin-Chrome" finish produced by a special process which results in a glare-free, non-reflecting surface against which markings and graduations stand out sharp and clear under any illumination. Other important refinements now included on Starrett micrometers are: "Hi-Micro" mirror-like finish on faces of anvils and spindles, which insures more accurate measurements; micrometer screw hardened, stabilized, and with threads ground from the solid; new quick-reading figures, with every graduation on the thimble numbered for positive identification; decimal equivalents marked on frame; and simple adjustment for wear. 125

Diamond Face-Milling Cutter

Face-milling cutter with solid triangular carbide blades that can be quickly and accurately adjusted or interchanged without removing the cutter-head from its operating position. Each blade can be positioned to present three separate cutting edges to the work, after which it can be reversed to present the three cutting edges at the opposite end. Thus each blade is the equivalent



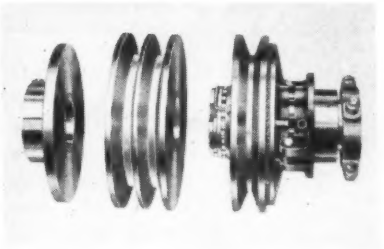
of six single-point cutting tools. Announced by Diamond-Detroit, Inc., General Motors Building, Detroit, Mich. 126

Circular Form-Tool Blanks for Automatic Screw Machines

The Production Service Co., 1060 Broad St., Newark 2, N. J., has just announced the development of a complete line of circular

To obtain additional information on equipment described on this page, see lower part of page 216.

form tool blanks, from which circular tools can be quickly finished for use on any type of automatic screw machine. These blanks are made from a standard brand 18-4-1 high-speed steel, and can be furnished soft or hardened to 64-65 Rockwell C. 127



Edgemont Clutch

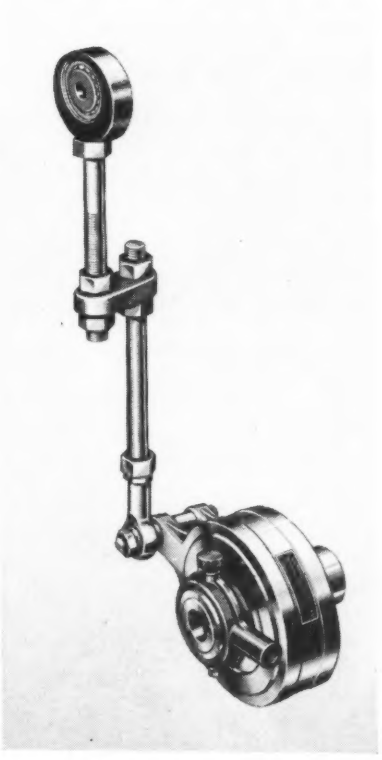
Self-contained V-belt clutch pulley, with either one or two V-belt grooves machined as an integral part of the clutch assembly, for use in driving special machinery. Furnished in 1/4- and 1/2-H.P., 100-R.P.M. ratings. This clutch is available with V-belt grooves of various pitch diameters, and is applicable to such equipment as small portable conveyors, motor-powered mowers, etc. Illustration shows clutch assembly with single V-belt pulley at right. Adapter plate and double V-belt pulley, which can be assembled with clutch, are shown at left. Announced by Edgemont Machine Co., 2133 Home Ave., Dayton 1, Ohio..128

Tool for Lapping Micrometer Anvils

"Mic-Lap" precision tool designed for lapping measuring surfaces of spindle and anvil of micrometers so that they will be parallel with each other and at right angles to the axis of the spindle. The lapping tool is applied to the micrometer in the manner shown in the illustration. Made by Mic-Lap Co., 68 Devonshire St., Boston 9, Mass....129

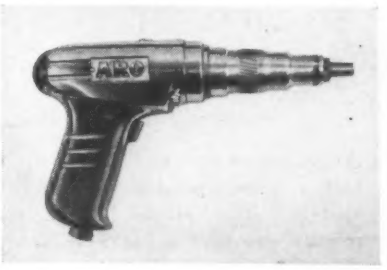
"Select-O-Matic" Ratchet Feed Unit for Power Presses

A "Select-O-Matic" multi-pawl type feeding unit for the power presses manufactured by the Carl G. Peterson Co., East Providence 14, R. I., has just been announced by Earl Elwyn Smith & Associates, Department Mchy., P. O. Box 53, West Hartford 7, Conn., national distributors of the attachment. This universal ratchet feed unit can be attached to any make of press roll feed employed for intermittent uniform feeding of brass, steel, or other metal stock from coils. A 210-tooth ratchet wheel, enclosed in an aluminum housing containing thirty-two pawls so designed that only one pawl engages the ratchet at any given moment, makes it possible to feed stock through the die within accuracy limits of less than 0.001 inch when using feed-rolls 2 inches in diameter...130



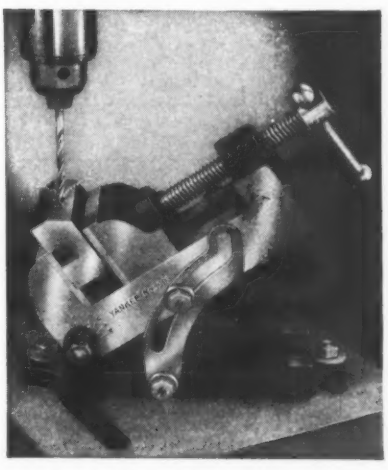
Aro Reversible Screwdriver

Air-powered reversible screwdriver and nut-setter with sufficient power for driving No. 1 to 10 machine or wood screws and setting 1/4-inch nuts. The free speed is 1000 R.P.M. and the working speed approximately 750 R.P.M. Forward and reverse drive are controlled by convenient button. Furnished with adjustable friction clutch. Weight, 2 3/4 pounds; over-all length, 9 1/8 inches. Manufactured by Aro Equipment Corporation, Bryan, Ohio. 131



"Yankee" Angle Vise

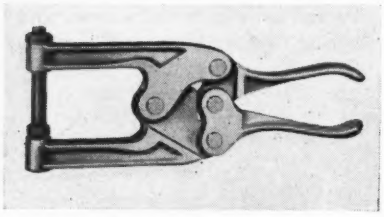
"Yankee" angle vise with both sides, front end, and bottom accurately ground for use on drill press, milling machine, or bench; also available with swivel base. Made in two sizes with hardened steel jaws, 2 and 2 3/4 inches wide, having maximum opening capacities of 1 15/16 and 3 inches, respectively. Each vise has a 90-degree scale for angular settings and is equipped with a ground V-block. Manufactured by North Brothers Mfg. Co., Division of Stanley Tools, Lehigh Ave. and American St., Philadelphia 33, Pa. 132



To obtain additional information on equipment described on this page, see lower part of page 216.

Knu-Vise Clamping Pliers

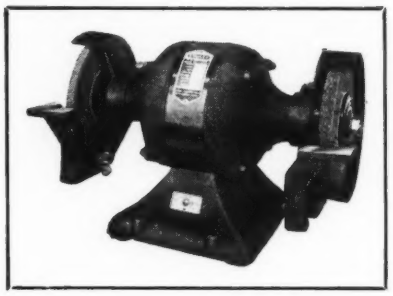
Knu-Vise clamping or holding pliers added to the line of the Lapeer Mfg. Co., Lapeer, Mich. The new pliers have greater



throat capacity and apply a higher pressure than previous models. The larger 3/8-inch spindle provides a more secure clamping grip. For use in welding operations, the pliers can be furnished with copper spindles to which weld spatter does not adhere. Made in two models, one with a throat capacity of 1 9/32 by 2 1/4 inches which provides a clamping pressure of 1200 pounds, and the other with a throat capacity of 1 9/32 by 1 1/4 inches which provides a clamping pressure of 1800 pounds. 133

Stanley Bench Grinder

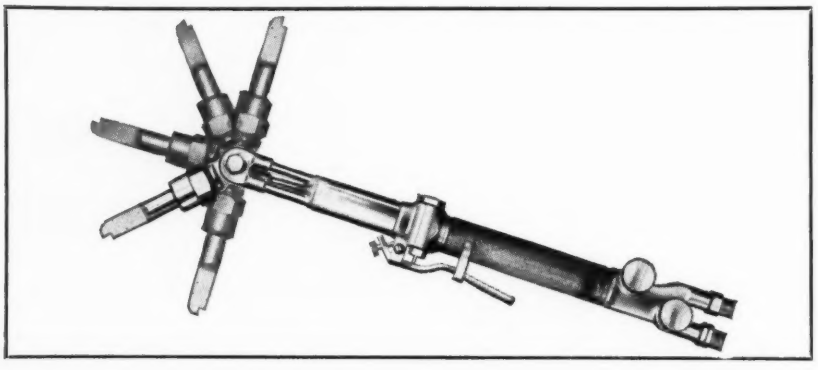
Bench grinder driven by a ball-bearing constant-speed 1/4-H.P. induction motor. Suitable for light grinding, tool sharpening, buffing, polishing, and wire-

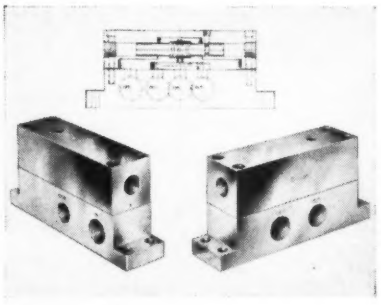


brush work. Guards are adjustable to permit grinding at any point on circumference of wheels. The speed at 60 cycles is 3450 R.P.M. Furnished with two 6- by 2-inch wheels, one coarse and one fine. Made by Stanley Electric Tools, New Britain, Conn. 134

Metal-Cutting and Welding "Cristorch"

The oxy-acetylene welding and cutting torch here illustrated is a new product of the Hamilton Tool Co., Ninth St. at Hanover, Hamilton, Ohio. The head of this torch can be revolved through an arc of 180 degrees, as indicated by the phantom views. The adjustable feature makes it possible to weld in places that were previously inaccessible. The torch will cut metal from 1/32 inch to 4 inches thick, and can be used to cut straight or beveled holes and circular disks from 3/8 inch to 30 inches in diameter that are accurate within working limits of 1/64 inch.....135





Valley Air-Control Valves

Three- and four-way master control valve for air cylinders, designed to maintain a tight seal through long-continued use. Made in 1/4- to 1-inch pipe sizes, with provision for adding accessories for hand and foot operation. Manufactured by Valley Tool Co., 5515 E. Slauson Ave., Los Angeles 22, Calif. 136

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in August, 1948, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME..... **POSITION OR TITLE**.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

CITY.....**STATE**.....

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 222 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the August, 1948, Number of MACHINERY

Plastic Extrusion Tables

ISLAND EQUIPMENT CORPORATION, 27-01 Bridge Plaza North, Long Island City 1, N. Y. Bulletin MPI, on plastic extrusion tables for the economical handling of extruded plastics. Copies available from the corporation to those making a request on their company's stationery.

Salt-Bath Heat-Treating

AJAX ELECTRIC CO., INC., Frankford Ave. at Delaware Ave., Philadelphia 23, Pa., has brought out a new house organ entitled "Tips and Trends," devoted to salt-bath heat-treatment, which will contain articles describing the various heat-treating processes adaptable to salt baths, and explaining how heat-treating problems have been solved by the use of salt-bath furnaces. 1

Machine Tools

CINCINNATI MILLING AND GRINDING MACHINES, INC., Cincinnati 9, Ohio. General catalogue M-1646, illustrating and describing the line of machine tools made by this company, which include milling, broaching cutter-sharpening, grinding, lapping, and flame-hardening machines. Data is also included on "Cimcool" cutting fluid. 2

Nickel Alloys

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York 5, N. Y. Booklet entitled "66 Practical Ideas for Metal Problems in Electrical Products," containing service stories showing how electrical manufacturers have used high nickel alloys to overcome corrosion, heat, vibration fatigue, wear, and other performance hazards. 3

Milling Cutters

INGERSOLL MILLING MACHINE CO., Rockford, Ill. Catalogue 56, describing in detail the Ingersoll complete line of inserted-blade milling and boring tools, including a new series of carbide-tipped "Shear Clear" face mills for steel and cast iron. Information on cutter selection is included. 4

Cylindrical Grinding Machines

LANDIS TOOL CO., 12 E. Sixth St., Waynesboro, Pa. Catalogue B-45, illustrating and describing the Landis 6-inch Type CH plain hydraulic cylindrical grinding machine, and typical applications, including automatic visual sizing and grinding with the wheel-base set at an angle. 5

Roller Box-Tool

INTERNATIONAL TRADE RELATIONS AGENCY, INC., Industrial Division, 832 Washington Bldg., Washington 5, D. C. Circular entitled "An Outstanding Achievement in Production Engineering," describing a roller box-tool of new design made by the Saunders Tool Co. of Great Britain. 6

"Time-Saver" Table

WEST COAST AERO TOOL CO., 5401 Fountain Ave., Los Angeles 27, Calif. "Time-Saver Table," available in either notebook size or as a wall chart, for determining quickly the number of parts that can be cut from a given amount of material. 7

Turret Lathes and Automatics

WARNER & SWASEY CO., Cleveland 3, Ohio. Catalogue containing 32 pages of data on the company's line of turret lathes, single- and multiple-spindle automatics, precision threading and tapping machines, and geared scroll chucks. 8

Rocker-Arm Welders

PROGRESSIVE WELDER CO., 3050 E. Outer Drive, Detroit 12, Mich. Technical bulletin 702, describing the company's improved line of air-operated rocker-arm welders for high-production spot-welding in light- to medium-duty applications. 9

Industrial Cleaning Materials

OAKITE PRODUCTS, INC., 26 Thames St., New York 6, N. Y. Leaflet describing two specialized materials known as "Oakite Di-Sanite" and "Oakite Tri-Sanite," for cleaning, disinfecting, and deodorizing uses in industrial plants. 10

Armored Gears

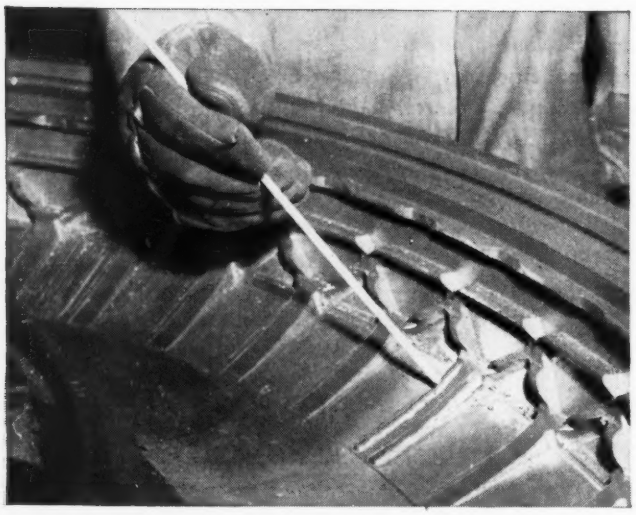
PITTSBURGH GEAR CO., Department M, 27th and Smallman Sts., Pittsburgh 22, Pa. Folder descriptive of the new line of Pittsburgh guaranteed "armored" gears, designed to provide increased strength and longer service. 11

Precision Machines

HAUSER MACHINE TOOL CORPORATION, Manhasset, N. Y. Catalogue describing Swiss-built precision machines handled by this concern, including jig boring machines; optical checking and meas-

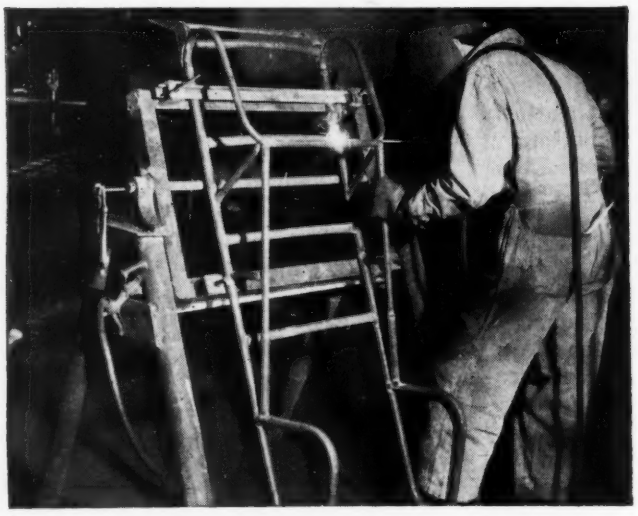
New Electrode Solves Many Welding Problems

Lincoln "Shield-Arc LH-70," for mild steel and hard-to-weld steels, operates in all positions, a.c. or d.c.

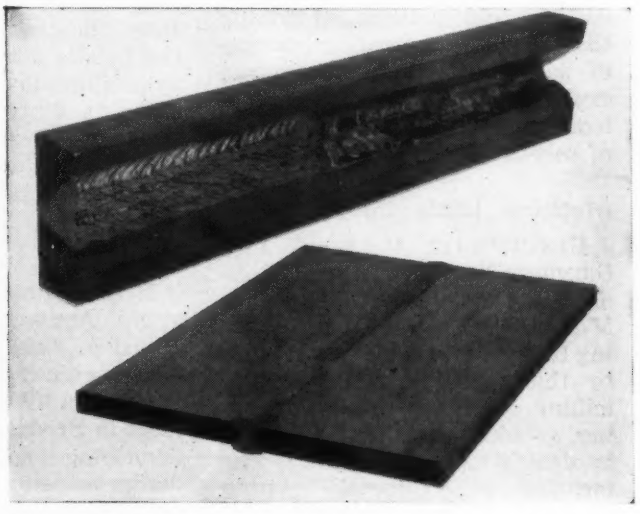


EASILY MACHINED. This manufacturer of tire molds, made of high-sulphur (free machining) steel, has simplified repair work with "Shield-Arc LH-70" because its deposits are easily machined and dense. Ribs in mold shown are being built up along edges due to machining error. Welded ribs will then be machined to proper size.

BANISHES POROSITY. In fabricating sprockets, this manufacturer welds together a disc of mild steel plate and a hub of round cold-rolled stock as shown. Formerly welds were porous; with "Shield-Arc LH-70," they are dense and smooth.



ELIMINATES HEAT-TREATMENT. In the welding of high-carbon, thin-walled tubing, this Company had to use costly heat-treating. This has been eliminated by welding with "Shield-Arc LH-70." Similar benefits are being obtained for high-tensile steels and welds to be porcelain enameled without annealing.



EASY . . . FAST. Many shops are using "Shield-Arc LH-70" for mild steel. On bevelled horizontal butt joints (above), it eliminates need for or materially reduces back-chipping and it can be used with easy straight-drag technique—no whipping required. On down-hand square butts (below), "LH-70" gives 15% to 20% faster welding because of ability to use higher current and get deeper penetration.

The above is published by LINCOLN ELECTRIC in the interests of progress. For further information on "Shield-Arc LH-70," write The Lincoln Electric Company, Dept. 48, Cleveland 1, Ohio.

Advertisement

pring apparatus; and special automatic machines for watchmaking and similar industries. 12

Universal Die-Casting Machines

CLEVELAND AUTOMATIC MACHINE CO., Cincinnati 12, Ohio. Bulletin describing in detail the Cleveland Model 200 universal hydraulic die-casting machine adapted for casting zinc, tin, and lead; also aluminum, magnesium, and brass.....13

Blast Cleaning

PANGBORN CORPORATION, 1406 Pangborn Blvd., Hagerstown, Md. Bulletins 214 and 215, illustrating and describing, respectively, the operation and application of Roto-blast airless blast cleaning equipment and the Pangborn blast cleaning table. 14

Electric Tachometers

CROWN INDUSTRIAL PRODUCTS CO., 1502 E. 53rd St., Chicago 15, Ill. Leaflet announcing a new electric panel tachometer for continuous, accurate speed measurements on machine tools, Diesel engines, textile machines, and other types of machines. 15

Nickel-Silver and Nickel-Brass Alloys

TITAN METAL MFG. CO., Bellefonte, Pa. Pamphlet giving properties and applications of Titan nickel-silver and nickel-brass alloys, as well as the results of corrosion and erosion tests made on these alloys. 16

Diamond Grinders

BRIDGEPORT-DIAMOND MACHINE CO., 2362 Main St., Stratford, Conn. Catalogue illustrating and describing the line of diamond grinders made by this concern for use in steel mills, paper mills, shear-knife manufacturing plants, etc. 17

Resins and Plastics

BAKELITE CORPORATION, 300 Madison Ave., New York 17, N. Y. Catalogue J-547a, containing information on the many forms in which Vinylite resins and plastics are available and their properties and uses. 18

Tungsten-Carbide Dies

ADAMAS CARBIDE CORPORATION, 40-30 Twenty-third Street, Long Island City 1, N. Y. Folder describing how tungsten-carbide dies will increase the efficiency of wire straightening and forming equipment. 19

Cemented-Carbide Tools

KENNAMETAL, INC., Latrobe, Pa. Catalogue 48, covering the entire line of Kennametal tools, made in widely diversified styles and sizes. Typical applications are illustrated and complete specifications are included. 20

Gang Punching Machines

VERSON ALLSTEEL PRESS CO., 9309 S. Kenwood Ave., Chicago 19, Ill. Bulletin GPM-48, illustrating and describing the Verson line of gang punching machines for multiple punching of holes in steel sheets and plates. 21

Carbide Micro Mills

SEVERANCE TOOL INDUSTRIES, INC., 636 Iowa Ave., Saginaw, Mich. Bulletin 16-W, on the new carbide micro-mills made by this company and carbide midget mills. Operating data, such as speeds, application, etc., is included. 22

Automatic Machines and Press-Room Equipment

U. S. TOOL COMPANY, INC., Ampere (East Orange), N. J. Catalogue descriptive of the company's line of Multi-Slide machines, Multi-Millers, and automatic press-room equipment. 23

Adjustable-Speed Drives

RELIANCE ELECTRIC & ENGINEERING CO., 1077 Ivanhoe Road, Cleveland 10, Ohio. Bulletin 311, covering the latest developments in all-electric adjustable-speed drives for alternating-current circuits. 24

Metal-Cutting Tools

RELTOOL CORPORATION, Milwaukee 3, Wis. Catalogue containing 72 pages covering the complete line of Reltool metal-cutting tools, including end-mills and holders, milling cutters, metal slitting saws, special saws, and other equipment. 25

Induction Motors and Generators

ARMA CORPORATION, 254 Thirty-sixth St., Brooklyn 32, N. Y. Catalogue illustrating and describing Arma induction motors and generators designed specifically for high-performance servo and instrumentation application. 26

Flexible Couplings

CLIMAX FLEXIBLE COUPLING CO., 863 E. 140th St., Cleveland 10, Ohio. Bulletin 80, describing the new Type C-O small-size, lightweight, flexible couplings, designed to handle low torque requirements. 27

Carburizing Steel

JOSEPH T. RYERSON & SON, INC., Box 8000-A, Chicago 80, Ill. Circular giving analyses, properties, and heat-treatment for an improved carbon-manganese carburizing steel known by the trade name "Rycase." 28

Sand Rammers

ROTOR TOOL CO., Cleveland, Ohio. Bulletin 32, describing a new line of bench and floor type sand rammers for use in gray iron, steel, malleable, aluminum, and magnesium foundries. 29

Self-Opening Die-Heads

EASTERN MACHINE SCREW CORPORATION, 23-43 Barclay St., New Haven 6, Conn. Bulletin 5, illustrating and describing the H & G general-purpose self-opening die-head with hobbed chasers. 30

Hydraulic Presses

COLONIAL BROACH CO., Box 37, Harper Station, Detroit 13, Mich. Bulletin PS-48, describing the Colonial expanded line of hydraulic presses for straightening both rough and finished work. 31

Hydraulic Presses

R. D. WOOD CO., (Public Ledger Bldg.) Philadelphia, Pa. Bulletin illustrating typical examples of the various types of hydraulic presses designed by this company to meet specific requirements. 32

Permanent-Magnet Sub-Assemblies

GENERAL ELECTRIC CO., Pittsfield, Mass. Booklet CDM-16, describing permanent-magnet sub-assemblies ready for installation in a final product. 33

Welders' Guide

HOBART BROTHERS CO., Troy, Ohio. Vest-pocket booklet contain-

ing a variety of useful welding information, including welding procedure, types of joints, typical positions, causes of common welding troubles, etc. 34

Heavy-Duty Gage-Blocks and Fixtures

WEBBER GAGE CO., 12900 Triskett Road, Cleveland 11, Ohio. Pamphlet descriptive of Webber heavy-duty precision gage-blocks and fixtures. 35

Installation of Pipe Fittings

STANLEY G. FLAGG & CO., INC., 1421 Chestnut St., Philadelphia 2, Pa. Folder containing specific instructions on how to install Flagg-Flow fittings and the equipment to use. 36

Air-Clamp Jig Base

INDUSTRIAL CLUTCH CORPORATION, Waukesha, Wis. Leaflet containing specifications covering an air-operated work-holding fixture designed to increase production on drilling operations. 37

Precision Grinding Spindles

POPE MACHINERY CORPORATION, 261 River St., Haverhill, Mass. Bulletin S-2, covering the complete range of Pope precision grinding spindles with sealed-in lubrication. 38

Mechanical Differentials

ARMA CORPORATION, 254 Thirty-sixth St., Brooklyn 32, N. Y. Folder descriptive of a line of mechanical differentials designed specifically for high-accuracy application. 39

Electro-Automatic Tool-Lifter

DECA CO., 4 N. Avalon Road, Great Neck, N. Y. Catalogue describing the "Diener" electro-automatic tool-lifter for shapers and planers, which is designed to lift the tool automatically on the return stroke. 40

Lubriplate Tag Plan

FISKE BROTHERS REFINING CO., Newark 5, N. J. Publication entitled "Lubriplate Film," describing the Lubriplate tag plan, which assures proper lubrication of machines after they leave the builder's plant. 41

Sapphire Gages

SAPPHIRE PRODUCTS DIVISION, Elgin National Watch Co., Aurora, Ill. Circular on the company's line of sapphire plug gages, ring gages, and micrometers, containing descriptions and prices. 42

Welding Electrodes

ARCOS CORPORATION, 1500 S. Fiftieth St., Philadelphia 43, Pa. Technical data sheet giving the analyses of eleven electrodes for welding both high- and low-alloy castings. 43

Production Boring Tools

MADISON MFG. CO., Muskegon, Mich. Catalogue entitled "Boreaming with Madison Production Tools," containing complete specifications and examples of special applications. 44

Arc-Welders

ELECTRIC ARC, INC., 152 Jelliff Ave., Newark 8, N. J. Circular containing complete specifications on the "Nu-Arc" general-purpose alternating-current portable arc-welder. 45

Lathes

MONARCH MACHINE TOOL CO., Sidney, Ohio. Bulletin 1112, containing complete information on the Monarch Series 60 line of engine and toolmakers' lathes. 46

Respiratory Protection

AMERICAN OPTICAL CO., Southbridge, Mass. Chart listing the proper respiratory protection against more than 150 dusts, vapors, and gases. 47

Speed Control

REEVES PULLEY CO., Columbus, Ind. Circular on the applications, operating principle, and advantages of Reeves speed control equipment. 48

Electric Motors

ELECTRIC MOTOR CORPORATION, DIVISION OF HOWARD INDUSTRIES, INC., Racine, Wis. Catalogue 348, illustrating the entire line of EMC fractional-horsepower motors and bases, as well as gear reducers...49

Magnetic Separators

DINGS MAGNETIC SEPARATOR CO., 4740 W. McGeogh Ave., Milwaukee 14, Wis. Leaflet descriptive of Alnico "Perma-Pulley" magnetic separators. 50

Identification Tape

TOPFLIGHT TAPE CO., York, Pa. Pamphlet describing various industrial uses of Topflight self-adhesive tape. 51

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (August, 1948) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

NAME..... POSITION OR TITLE.....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM.....

BUSINESS ADDRESS.....

CITY..... STATE.....

By E.S.S.

BETWEEN GRINDS

Cooling-Off Period

We were reading about the safety program of a large company which includes "emergency showers installed just outside the doors of chemical laboratories. Should a chemist be spattered with strong acid or caustic, he need only step through the door and pull a chain to cover himself with a life-saving flood of diluting water." There are business men who could use such a device outside their office doors to cope with heat, humidity, or vitriolic "set-to's."

Steel Wool Gathering

A contemporary of ours recently published on their chatty page a joke lifted without apology from a college magazine about the urban freshman engineering student who thought steel wool came from hydraulic rams. The columnist stated by way of comment that this "steal" did not affect his conscience because college magazines are notorious for swiping humor, and added, "By the way, where does steel wool come from?" On the alert, we step in, cashing in on the joke and the columnist, with our suggestion that he refer to May, 1946, MACHINERY, page 165, "Equipment for Steel Wool Manufacture." And if he is in earnest, he can consult the archives because way back in November, 1927, we published "Do You Know How Steel Wool is Made?" and in January, 1928, "Steel Wool and Its Manufacture."

The Similarity is Purely Oriental

In Japan now appears a magazine entitled "Machinery." So we hear from the Civil Affairs Division of the War Department who wrote to us that its editor requested permission to republish one of MACHINERY'S articles ("Application of Bevel Gears and Curved-Tooth Couplings," May, 1948). We obliged, although we do not wish to be confused with our Japanese namesake, since we are not affiliated. Any time you browse through that magazine, by way of brushing up on your Japanese or because you like to read in the original, please remember, it's not us.

"Cal" is in Demand

In February of '47, MACHINERY published a two-page description of a compound-angle calculator and recently sent on a letter asking about it to its designer, Lawrence F. Palmer. The latter wrote to us: "This is to thank you for forwarding the inquiry for the compound-angle calculator. Your readers from all sections of the country have sent inquiries regarding the availability of the instrument. The fine editorial article on the calculator has rendered me much valuable assistance."

Remember Us to Grandma

A purchaser of one of our books filling in his order blank, specified under *position* "Supt. & Grandpa." Gramp must have quite an assignment at home that he classifies the family relationship as a *position.*

HERBERT CHASE, Pen and Racket Swinger—When the Sibley College of Engineering, Cornell University, conferred the degree of mechanical engineer on Herbert Chase in 1908, it opened the locks on a flood of literature related to engineering, design, metal-working, and the like. Author of two books, "Die Castings" and "Handbook on Designing for Quantity Production," Mr. Chase has written scores of articles for both American and European publications (and still does; see page 147 of this issue). Although most of his time is taken up with technical journalism, he does play tennis at the West Side Tennis Club in Forest Hills, N. Y., scene of our national amateur and professional tennis championships. We, ourselves, belong there, so we tracked down Mr. Chase surreptitiously (no easy job in a club of sixty-odd courts) to see him in action. There he was, playing doubles as hard as though he were still competing on the Cornell tennis team. To counteract this energy-consuming diversion, Mr. Chase collects antiques, particularly early American furniture — but he didn't specify rocking chairs—no sir, not when you run around like that on a tennis court.

News of the Industry

California

LESTER-PHOENIX, INC., 2711 Church Ave., Cleveland, Ohio, manufacturer of injection molding machines and die-casting machines, has appointed the SEABOARD MACHINERY CO., 3212 E Olympic Blvd., Los Angeles, Calif., representative of the company in the Los Angeles area.

GILFRY WARD has been appointed vice-president of the Kellogg Division of the American Brake Shoe Co., 230 Park Ave., New York 17, N. Y. He has been with the company since graduating from college in 1928. Mr. Ward's headquarters are in Oakland, Calif.

KINMONT MFG. CO., INC., has recently moved into new quarters at 718 W. Wilson Ave., Glendale 3, Calif.

Illinois and Indiana

B. E. BASSETT has been appointed regional manager of the Western Cartridge Co. Division, Olin Industries, Inc., East Alton, Ill., and GEORGE L. DAWSON has been appointed regional manager of the Winchester Repeating Arms Co. Division, New Haven, Conn. Mr. Bassett has also been made a manufacturing executive of Olin Industries, responsible for coordinating the production methods of the Western Cartridge Co. and the Winchester Repeating Arms Co.

J. M. FULLER, president of the Harrington & King Perforating Co., 5655 Fillmore St., Chicago 44, Ill., has retired after sixty-two years of service with the company. FOYE P. HUTCHINSON was elected president to succeed Mr. Fuller, and JUDSON E. FULLER has been made vice-president and treasurer.

L. D. LITSEY has been appointed Chicago area representative for the worm-gear speed reducers made by De Laval Steam Turbine Co., Trenton, N. J. Mr. Litsey's headquarters will be at 6459 N. Sheridan Road, Chicago 26, Ill.

AMERICAN FOUNDRYMEN'S ASSOCIATION, 222 W. Adams St., Chicago, Ill., announces that the Association has voted to change its name to the AMERICAN FOUNDRYMEN'S SOCIETY.

S. G. TAYLOR CHAIN CO. is celebrating the seventh-fifth anniversary of the founding of the concern this year. The company was started in 1873 by S. G. Taylor, who began manufacturing chain in Chicago, and has been continuously under the same management. In 1911, the site of the plant was moved to Hammond, Ind., where the concern has been operating ever since. S. G. Taylor, Jr., joined the organization in 1888, and succeeded his father as head of the concern in 1901. While he is still active in the affairs of the company, his son, E. W. Taylor, is now president and general manager.

GEORGE O. LINVILLE, previously foreman of the body plant tool-room for the Studebaker Corporation, South Bend, Ind., has been promoted to the position of master mechanic. He has been connected with the company since 1915, when he joined the tool and die department. Mr. Linville succeeds LORIN R. RUNKLE in his new post.

Michigan

WHITMAN & BARNES DIVISION OF THE UNITED DRILL & TOOL CORPORATION, 40600 Plymouth Road, Plymouth, Mich., has let contracts for the immediate construction of a completely new plant, which will involve an expenditure of more than $2,500,000. The project was announced in connection with the one-hundreth anniversary celebration of the company. The new plant will consist of a single-story manufacturing building, 360 by 630 feet, and a two-story office building, 50 by 180 feet.

WICKMAN MFG. CO. has recently been organized to take over from the WICKMAN CORPORATION, Detroit, Mich., all activities in connection with the manufacture and sale of diamond wheels and related products. The headquarters of the new company will remain at Detroit, and the personnel is unchanged. The officers of the new company are: President, A. C. WICKMAN; executive vice-president, HANS MANDEL; and vice-president, HAROLD GODWIN.

AMECO CO., 9113 Kinsman Road, Cleveland, Ohio, has been appointed northeastern Ohio representative for the DETROIT DIE SET CORPORATION, of Detroit, Mich., and C. A. HUBLEY has been made representative of the company in the western Michigan territory, with headquarters at the home office, 2895 W. Grand Blvd., Detroit 2, Mich.

JOHN W. LEDUC has been appointed vice-president of the Castaloy Corporation, Detroit 17, Mich. Recently he had his own consulting and production engineering company known as John W. LeDuc & Associates.

METAL CUTTING TOOLS & MFG. CO., Berkley, Mich., announces that hereafter the company will operate under the name of the FULLER TOOL CO. There will be no change in policy or personnel, or location.

RITE-O-TOOL & GAGE CO. announces that it is now occupying its new building at 321 W. Ten Mile Road in Hazel Park, Mich., which provides increased manufacturing facilities.

J. RALPH GRIFFITH has been made sales manager of the Pioneer Pump & Mfg. Co., Detroit, Mich. For the last year he has been handling industrial sales.

GEORGE W. ALTMAN has been made general manager of Bridgman Castings, Inc., Bridgman, Mich.

New England

CHARLES CROMWELL has been appointed division sales manager of the Threadwell Tap & Die Co., Greenfield, Mass., for the north central territory, including Illinois, Wisconsin, Minnesota, Missouri, and Iowa. Mr. Cromwell has been associated with the Threadwell organization since it was acquired by the Sheffield Corporation, and prior to that was connected with the Sheffield Corporation.

Charles Cromwell, Newly Appointed Division Sales Manager of the Threadwell Tap & Die Co.

This is a *Fast Turning* Job

From Which No One Derives a Profit

It may be fun for a puppy to pursue its appendage—but when the puppy is wages and the tail is prices, the situation is serious.

Once in a while the puppy catches the tail—but the strain is too great. So, prices break away—and the mad scramble is on again.

What causes the price-wages spiral?

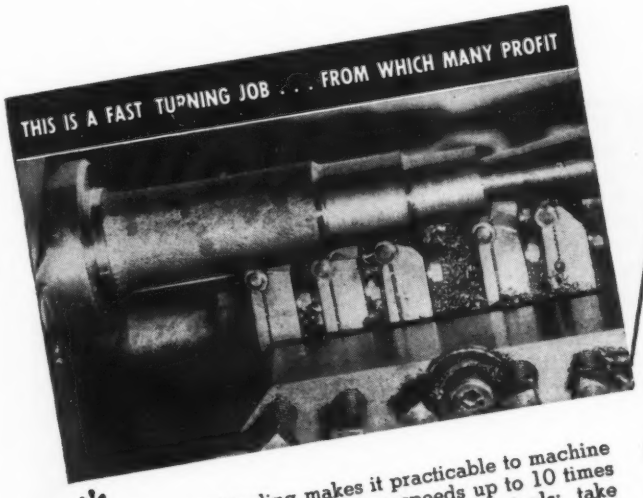
The selfish interest of management, or labor? No, we think not. After all—both groups are composed of good citizens. And, as good citizens, each is entitled to receive fair pay for work done, plus a reasonable reserve to insure future security.

Is it, then, that the intrinsic cost of goods is becoming greater and greater? No. Modern tools of production enable one man and one machine to produce as much as 5 times more than they did 10 years ago.*

What, then? We might as well face the fact—the value of money is becoming less and less. A deteriorating currency is a basic cause of price rises—and wage increases are required to offset them.

The convertible gold standard is not perfect but it is the most practical and reliable measure of value ever devised. It provides the essential inflexible yardstick by which values may be compared, and commitments made with actual, as well as implied integrity.

A bill has been introduced in the Congress to restore stability to the dollar, making all currency freely convertible to gold. We suggest you write your Congressman for a copy of H. R. Bill 5031, study it, and take action.



* Kennametal tooling makes it practicable to machine steel and cast iron at cutting speeds up to 10 times faster than those possible with steel tools; take interrupted cuts on steel and cast iron at the same speeds used for continuous cutting; cut steel in the hardened state, thereby often eliminating annealing and rehardening operations, and . . . turn out from two to five times as much as high speed steel tools on the same machine and in the same time.

This Bill is Needed to Guarantee a Reliable Index of Individual and Corporate Profit

H. R. 5031

To restore the right of American citizens to freely own gold and gold coins; to return control over the public purse to the people; to restrain further deterioration of our currency; to enable holders of paper money to redeem it in gold coin on demand; to establish and maintain a domestic gold coin standard; and for other purposes.

KENNAMETAL *Inc.*

LATROBE, PA., U. S. A.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION

A. Price Drummond, Manager of Engineering, Machine Tool Division, Pratt & Whitney

PAUL MUELLER, formerly machine tool engineering head of the Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., has been relieved of his previous duties in order to permit him to devote his full time to engineering research. He will be associated with MILTON CHANDLER, engineering head of the Chandler-Evans Division of the company. A. PRICE DRUMMOND has been appointed manager of engineering in the Machine Tool Division. Mr. Drummond has been connected for many years with the National Carbon Co. of Cleveland.

NORTON CO., Worcester, Mass., announces the appointment of HARLAN T. PIERPONT, JR., as sales manager of the Refractories Division, succeeding ROBERT KIRKPATRICK, who is retiring after twenty-nine years of service with the company. Mr. Pierpont was previously abrasive engineer for the company in Michigan, and that position will now be filled by NORMAN V. CRABTREE. MURNER E. THOR has been added to the staff of refractories engineers.

ALBERT R. CRANKS has been appointed district representative for the Threadwell Tap & Die Co., Greenfield, Mass., in western Pennsylvania, New Jersey, Delaware, Maryland, and the District of Columbia. AUBREY OZIAS has been named field engineer for the company. Mr. Ozias joins the Threadwell organization after ten years of experience as cutting tool engineer for the Ford Motor Co. and Continental Motors.

B. C. AMES CO., Waltham 54, Mass., announces the appointment of the following representatives to handle the company's line of micrometer dial gages and indicators: SYBRANDT CO., 4500 Euclid Ave., Cleveland, Ohio; and ALLAN P. JAMES CO., 419 Tenth St., San Francisco, Calif.

REED ROLLED THREAD DIE CO., Worcester, Mass., has purchased the CLEVELAND DIE & MFG. CO., of Cleveland, Ohio. The latter company was organized in 1907 by HENRY BOCKELMAN. Mr. Bockelman will continue as manager of the Cleveland plant until it is moved to Worcester, after which he will act as consultant for the company in Worcester.

LELAND-GIFFORD CO., Worcester 1, Mass., has appointed JEFTS G. BEEDE sales engineer for the company in the Boston territory, including eastern Massachusetts and northern New England.

C. I. HAYES, INC., 75 Baker St., Providence, R. I., announce the appointment of LEONARD J. EDWARDS, as New England sales representative for the company's line of electric heat-treating and hardening furnaces.

EDWIN R. FELLOWS, II, export sales manager of the Fellows Gear Shaper Co., Springfield, Vt., started in July on a six months' business trip to Europe. His itinerary will include England, France, Holland, Switzerland, Italy, Norway, Finland, Australia, and Czechoslovakia.

New Jersey

THOMAS R. TURNER has been appointed divisional sales representative in Virginia, Maryland, Delaware, southern New Jersey and eastern Pennsylvania for the line of hydraulic machinery made by the Watson-Stillman Co., Roselle, N. J. His headquarters will be at the home office of the company.

H. L. WATSON has retired as president of the De Laval Steam Turbine Co., Trenton, N. J., after thirty-five years of service, and GEORGE W. SMITH, JR., has been elected his successor. Mr. Watson will continue to serve the company in the capacity of director and chairman of the executive committee.

THOMAS A. EDISON, INC., Medical Gas Division, with offices at Bloomfield, N. J., Stuyvesant Falls, N. Y., and Watertown, Mass., has been appointed distributor for the products made by the K-G Welding & Cutting Co., Inc. of New York.

A. L. HAWK has been appointed assistant to the western district manager in Chicago of Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J. R. B. HAZARD has been made manager of distributor sales for the western district.

JOHN H. MATTHEWS, vice-president and director of Raybestos-Manhattan, Inc., Passaic, N. J., was elected a member of the board of directors of the Canadian Raybestos Co., Ltd., at the recent annual meeting of the company.

RUSSELL E. EBERSOLE has been appointed general manager of lamp sales for the Westinghouse Electric Corporation at Bloomfield, N. J.

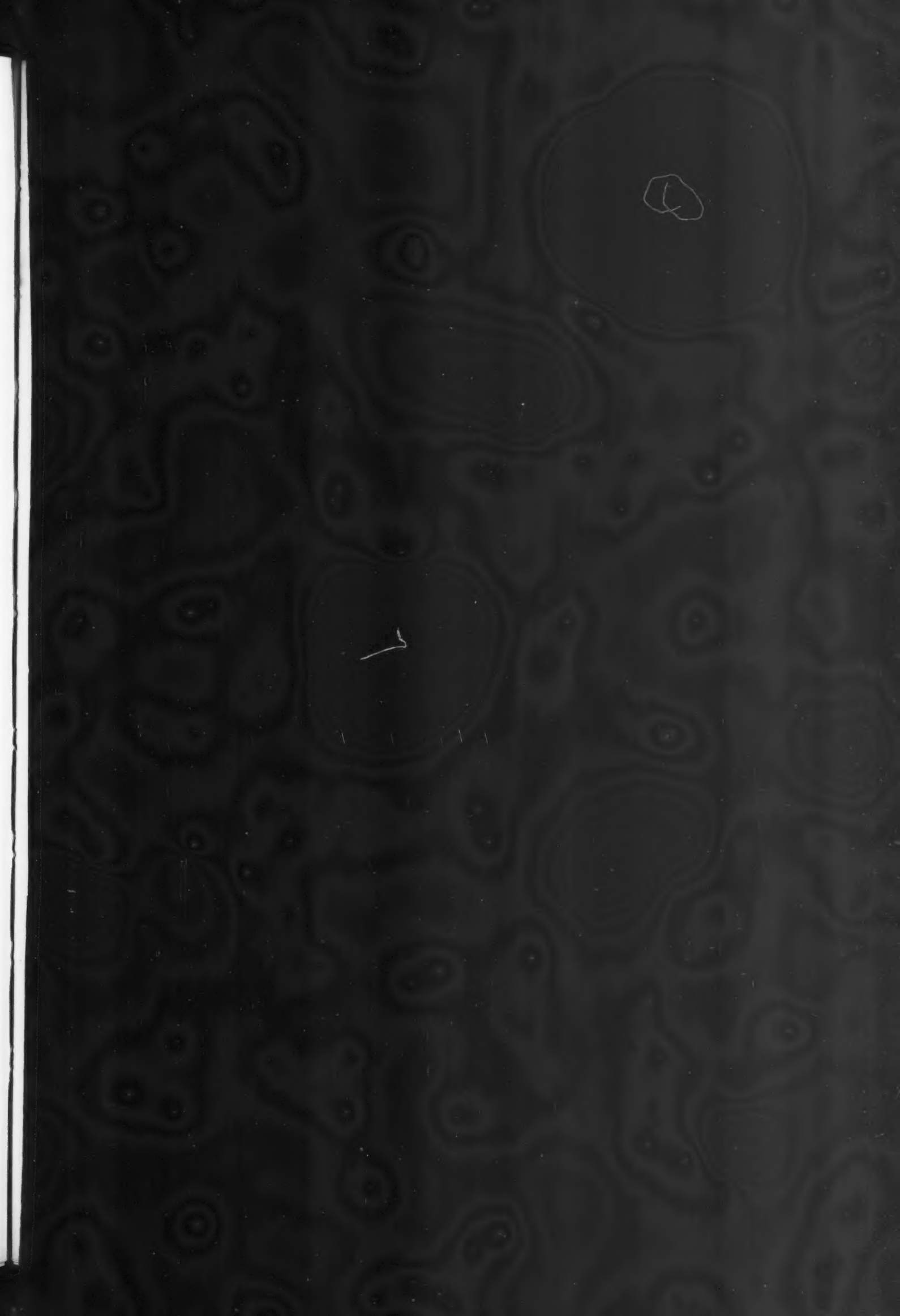
New York

HAUSER MACHINE TOOL CORPORATION, Manhasset, N. Y., newly organized distributor for the line of precision jig borers and grinders and optical measuring instruments built by the Swiss firm of Hauser, Ltd., announces the appointment of the following representatives: EARL ELWYN SMITH, 53 Woodrow St., West Hartford 7, Conn.; KRAUSE MACHINERY CO., 90 West St., New York 6, N. Y.; ANDERSON & CLARK, 607 Wysor Bldg., Muncie, Ind.; and DILTS S. MCHUGH, Wichita 7, Kan.

HEWITT-ROBINS, INC., manufacturer of rubber products and materials-handling equipment, announces that it is now occupying new executive sales offices that take up the entire eighteenth floor of the building at 370 Lexington Ave., New York 17, N. Y. The executive offices were formerly located at 70 Pine St. The new location will also serve as eastern sales offices of the company.

NORMAN R. FORREST has been appointed sales and advertising manager of K. R. Wilson, Buffalo, N. Y., manufacturer of hydraulic presses. Mr. Forrest has had wide experience during the last fifteen years in both

Norman R. Forrest, Recently Appointed Sales and Advertising Manager of K. R. Wilson



SELECTION OF V-BELT DRIVES FOR MACHINE TOOLS—3

Table 3. Dimensions of V-Belts and Sheaves

Belt Cross-Section	V-Belt Dimensions, Inches		Sheave Dimensions, Inches			
	Width at Top	Depth	Groove Spacing	Pitch Diameters: Stock	Pitch Diameters: Non-Stock	Add to *pd* to Obtain Outside Diameter
A	1/2	11/32	5/8	3.0 to 6.4 (0.2-inch increments)*; 7.0*, 8.2*, 9.0*, 10.6*, 12.0*, 15.0*, 18.0*	3 to 36 (1-inch increments); 38 and 40	3/8
B	21/32	7/16	3/4	5.0*, 5.2*, 5.4, 5.6, 5.8, 6.0, 6.2, 6.4, 6.6, 6.8, 7.0, 7.4*, 8.6, 9.4*, 11.0, 12.4*, 13.6, 15.4*, 16.0, 18.4*, 20.0, 25.0, 30.0, 38.0	7 to 36 (1-inch increments); 38 to 60 (2-inch increments)	1/2
C	7/8	17/32	1	9.0, 9.2, 9.4, 9.6, 9.8, 10.0, 10.2, 10.6, 13.0, 16.0, 20.0, 24.0, 30.0, 36.0, 44.0, 50.0	11 to 36 (1-inch increments); 38 to 72 (2-inch increments)	3/4
D	1 1/4	3/4	1 7/16	13.0, 13.4, 13.8, 14.2, 14.6, 15.0, 15.4, 18.0, 22.0, 27.0, 33.0, 40.0, 48.0	14.0; 16 to 36 (1-inch increments); 38 to 96 (2-inch increments)	7/8
E	1 1/2	1	1 3/4	None	20 to 36 (1-inch increments); 38 to 96 (2-inch increments)	1 1/8

*Available in widths having one to six grooves only.

Table 4. Correction Factor for Arc of Contact

Arc of Contact R. Degrees	180	176	170	164	160	155	150	145	140	133	130	125	120	110	100	90
Correction Factor	1.00	0.99	0.98	0.96	0.95	0.94	0.92	0.91	0.89	0.87	0.86	0.84	0.83	0.79	0.74	0.69

Table 5. Standard Lengths of V-Belts

Standard Nominal Length, Inches	Standard Pitch Lengths for Belts of Various Cross-Sections, Inches				
	A	B	C	D	E
26	27.0	....	....	.....	.....
31	32.0	....	....	.....	.....
33	34.0	....	....	.....	.....
35	36.0	36.5	....	.....	.....
38	39.0	39.5	....	.....	.....
42	43.0	43.5	....	.....	.....
46	47.0	47.5	....	.....	.....
48	49.0	49.5	....	.....	.....
51	52.0	52.5	53.0	.....	.....
53	54.0	54.5	....	.....	.....
55	56.0	56.5	....	.....	.....
60	61.0	61.5	62.0	.....	.....
62	63.0	63.5	....	.....	.....
64	65.0	65.5	....	.....	.....
66	67.0	67.5	....	.....	.....
68	69.0	69.5	70.0	.....	.....
71	72.0	72.5	....	.....	.....
75	76.0	76.5	77.0	.....	.....
78	79.0	79.5	....	.....	.....
80	81.0	....	....	.....	.....
81	....	82.5	83.0	.....	.....
83	....	84.5	....	.....	.....
85	86.0	86.5	87.0	.....	.....
90	91.0	91.5	92.0	.....	.....
96	97.0	....	98.0	.....	.....
97	....	98.5	....	.....	.....
105	106.0	106.5	107.0	.....	.....
112	113.0	113.5	114.0	.....	.....
120	121.0	121.5	122.0	122.5	.....
128	129.0	129.5	130.0	130.5	.....
136	.....	137.5	138.0	.....	.....
144	.....	145 5	146.0	146.5	.....
158	.....	159.5	160.0	160.5	.....
162	.....	.....	164.0	164.5	.....
173	.....	174.5	175.0	175.5	.....
180	.....	181.5	182.0	182.5	183.5
195	.....	196.5	197.0	197.5	198.5
210	.....	211.5	212.0	212.5	213.5
240	.....	240.0	240.0	240.0	240.0
270	.....	270.0	270.0	270.0	270.0
300	.....	300.0	300.0	300.0	300.0
330	.....	.....	330.0	330.0	330.0
360	.....	.....	360.0	360.0	360.0
390	.....	.....	390.0	390.0	390.0

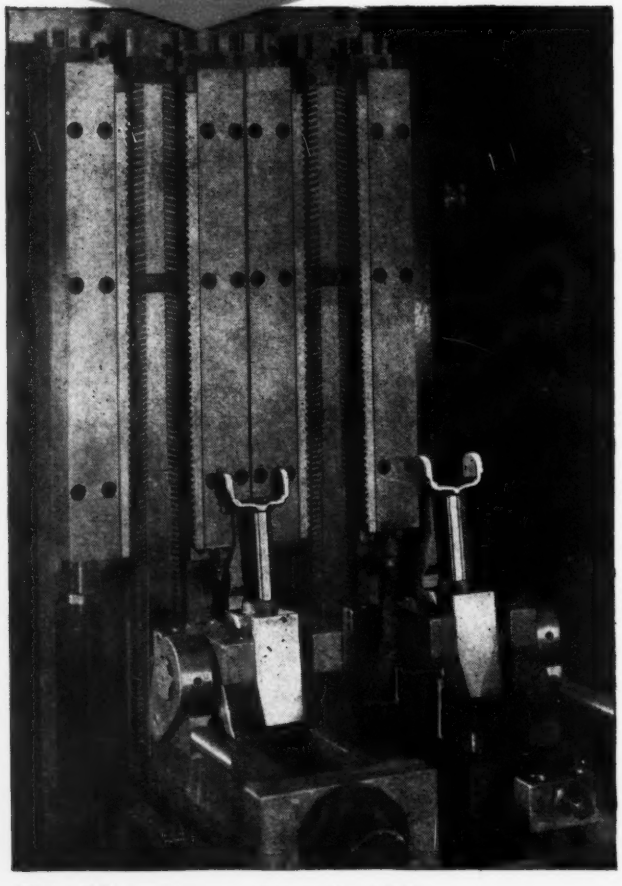
Broaching

UNIVERSAL JOINT FACES

- ✔ CUTS COSTS
- ✔ ELIMINATES LATER FINISHING OPERATION
- ✔ MAINTAINS CONCENTRICITY

280 PIECES PER HOUR

This single slide machine is tooled up for two universal joints. Each stroke of the slide produces two finish broached parts. In this application concentricity is held from the O.D. of the shank.



In addition to the concentricity being held (to either I.D. or O.D. of shank), finish on the joint faces is satisfactory for final assembly. Thus, broaching eliminates a later finishing operation that was required previously.

Production savings like these can be applied to many different parts similar to universal joints. Chances are that you have a part in your product where close tolerances could be maintained at a much higher rate of production with broaching. Detroit Broach application engineers are at your disposal to discuss these broaching problems. Through long experience specializing in broaches and broach tooling exclusively, we can give you actual cost and production data on your jobs before the tooling is built.

Call your local Detroit Broach representative or write today . . . it may be an important step toward cutting today's high cost of manufacturing.

DETROIT *Broach* COMPANY
20201 SHERWOOD AVENUE
DETROIT 12, MICHIGAN

the sales and production divisions of the metal-working industry, having previously been connected with the Ford Motor Co. and the Bell Aircraft Corporation. During the war, he was responsible for the design and production of many unusual dies, jigs, and fixtures used in the aircraft industry.

LANGEVIN MFG. CORPORATION, 37 W. 65th St., New York 23, N. Y., announces the sale of the Electronic Industrial Control Division to RALPH J. HUGH and STEPHEN J. DEITZ, formerly sales director and application engineer of the division. Industrial control devices of the type formerly manufactured by the Langevin Mfg. Corporation will now be produced by the S. J. DEITZ Co. and merchandised by RALPH J. HUGH ASSOCIATES, 11 W. 42nd St., New York 18, N. Y.

EDWARD H. ENBERG, JR., has been placed in charge of all standardization for the Kent Cliff Laboratories, Peekskill, N. Y., makers of micro hardness testing and allied equipment. JOHN B. VERRIER, JR., has been placed in charge of sales. Both Mr. Enberg and Mr. Verrier were associated for many years in similar capacities with the Wilson Mechanical Instrument Co., Inc.

E. J. G. PHILLIPS, director of engineering for the Richard Wilcox Mfg. Co., Aurora, Ill., was recently elected president of the Monorail Manufacturers Association, New York City. A. F. ANJESKEY, sales manager of the Cleveland Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio, was elected vice-president.

CARLSON Co., 277 Broadway, New York 7, N. Y., has recently opened an office to provide design and consultation service for manufacurers, engineers, and inventors. The company will specialize in the design of springs and mechanical products.

ROBERT A. WEBBER has been appointed manager of the Electric Furnace Division of the Canadian subsidiary of Electro Refractories & Alloys Corporation, Buffalo, N. Y. The Canadian plant is located at Cap-de-la-Madeline, Quebec.

L. S. STERNAL has joined the Jackson Buff Corporation, Long Island City, N. Y., as sales manager. He was previously methods engineer with the New York branch of the Minnesota Mining & Mfg. Co.

DECA Co., 4 N. Avalon Road, Great Neck, N. Y., has recently been organized to distribute an electro-automatic tool lifter for carbide tools, designed to be used on planers and shapers.

J. CARL BODE, formerly operating manager of the National Carbide Corporation, New York City, has been elected president, succeeding L. A. HULL, who has been made chairman of the board.

North Carolina and Tennessee

JEFFREYS ENGINEERING & EQUIPMENT Co., distributor of metal-working equipment and engineering consultant, announces the removal of its offices from Raleigh, N. C., to the Guilford Building, Greensboro, N. C.

DETROIT BROACH Co., Detroit, Mich., announces the appointment of the COATS-MOORE SUPPLY Co., 804 S. Main St., Memphis 2, Tenn., as representative.

Ohio

LINCOLN ELECTRIC Co. announces that plans have been made for the construction of a new manufacturing plant at East 178th St. and St. Clair Ave., Cleveland, Ohio. This expansion project will represent an investment of more than $10,000,000, and will ultimately provide about twenty-five acres of floor space under one roof. The new facilities will replace the company's present plant at 12818 Coit Road, and will house the headquarters offices.

JOSEPH T. RYERSON & SON, INC., have recently completed an addition to their Cleveland steel-service plant, which now comprises a total of about 250,000 square feet of floor space. The new two-story brick and concrete addition provides 80,000 square feet of warehouse space and 13,000 square feet of office space. The completion of the expansion program was celebrated by an "open house," which was attended by about 1500 people.

RALPH A. MITCHELL, vice-president of the Pittsburgh Forgings Co., Coraopolis, Pa., was elected president of the Drop Forging Association at the recent annual meeting in Swampscott, Mass. W. CLAIR SHAFFER, assistant to the president of the Michigan Forging Co., Detroit, Mich., was elected vice-president. The headquarters of the Association are at 605 Hanna Bldg., Cleveland, Ohio.

AMERICAN ROLLER DIE CORPORATION, Cleveland, Ohio, announces the acquisition of patent and sales rights formerly held by the McKinney Tool & Mfg. Co. of Cleveland. The latter company's products include a complete line of roll-forming machines and automatic cutting-off machines. These machines will be marketed under the former McKinney Tool & Mfg. Co.'s name, and will bear the "Ardcor" trade name of the American Roller Die Corporation.

PETER ROBERTSON, for the last four years works manager of the Truscon Steel Co., Youngstown, Ohio, subsidiary of the Republic Steel Corporation, has become assistant to the district manager of the Republic Steel Corporation at Cleveland. DOUGLAS K. FORSYTH has been promoted to Mr. Robertson's former position of works manager, and JOHN H. HAMILL has been appointed assistant works manager.

CLEVELAND TAPPING MACHINE Co., Hartville, Ohio, manufacturer of precision production tapping machines, announces two new additions to its national sales organization — the MEEHAN ENGINEERING Co., 1802 W. Genesee St., Syracuse 4, N. Y.; and STANLEY BERG & Co., Frick Bldg., Pittsburgh 19, Pa., and 605 Commercial Bldg., Erie, Pa.

RALPH S. POULSEN has been appointed district sales manager for the Ohio territory of the Lindberg Engineering Co., Chicago, Ill., manufacturer of heat-treating and melting furnaces. Mr. Poulsen previously served as assistant sales manager at Indianapolis. His headquarters are at 815 Superior Ave., Cleveland 14.

RALPH J. HESS has recently been promoted to the position of general superintendent of the Steel Improvement & Forge Co., Cleveland, Ohio. Mr. Hess will be in charge of all production operations of the company. He was previously production manager, and has been connected with the company since 1940.

DEFIANCE MACHINE WORKS, INC., Defiance, Ohio, has appointed the MODERN TOOL WORKS, LTD., 69 Montcalm Ave., Toronto, Ontario, Canadian distributor for the company's line of horizontal boring mills, heavy-duty drill presses, preform presses, and Tri-Dyne molding presses.

EDWARD G. GRAY has been appointed works engineer of the General Electric Co.'s laminated plastics plant in Coshocton, Ohio, and GEORGE ALEXANDER has been made assistant to the manager of that plant.

FRANK R. KOHNSTAMM was elected vice-president of Jack & Heintz Precision Industries, Inc., Cleveland, Ohio, at a recent meeting of the board of directors. He was previously general sales manager.

CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh, Pa., has granted a license to the GREER STEEL Co., Dover, Ohio, to manufacture "Cor-Ten," a corrosion-resisting, high-strength, low-alloy steel.

ROBERT D. WILLIAMS has been made personnel manager for Tinnerman Products, Inc., Cleveland, Ohio, manufacturer of "Speed Nuts."

Pennsylvania

KENNAMETAL, INC., Latrobe, Pa., manufacturer of cemented-carbide tools, has added the following men to its staff of application engineers: WILLIAM L. CHAMBERS, KENNETH TWOMBLEY, and CONRAD R. SEIM, 9 N. Jefferson St., Chicago, Ill.; GERALD TRANSUE, 3701 N. Broad St., Philadelphia, Pa.; and RALPH PEARCE, 600 Grant St., Pittsburgh, Pa. The company also announces the appointment of GERALD BOGNER, 6 West Broadway, New York City, as engineer and representative. DELMAR BAKER, formerly an application engineer, also has been made engineer and representative. His headquarters are at 9 N. Jefferson St., Chicago, Ill.

FRANK B. RACKLEY has been made general manager of sales for the Jessop Steel Co., Washington, Pa. He was previously head of stainless steel sales in the western area for the Carnegie-Illinois Steel Corporation. Mr. Rackley replaces T. W. Pennington, former vice-president of the Jessop Steel Co., who resigned recently.

CARBOLOY COMPANY, INC., Detroit, Mich., has appointed the BITTENBENDER CO., 126-132 Franklin St., Scranton, Pa., distributor for the company's products in northeastern Pennsylvania.

Texas

BIG THREE WELDING EQUIPMENT CO. of Houston and Fort Worth, Tex., has recently opened a new branch in Lubbock, Tex. The new branch will bring to the territory within a 150-mile radius of Lubbock selling and service facilities for Lincoln alternating- and direct-current "Shield-Arc" welders and electrodes, as well as gas welding equipment and welding accessories. Sales in the Lubbock branch will be under the direction of L. A. CARTER. GARY MADSEN is in charge of the office and wholesale operations.

LINK-BELT CO., Chicago, Ill., announces that it has made plans to erect a new plant in Houston, Tex. The new construction will comprise a one-story, all-steel factory building with three bays, and a two-story office section. Approximately 45,000 square feet of floor space will be provided by the new plant.

CUTLER-HAMMER, INC., Milwaukee, Wis., electrical manufacturer, announces the removal of its Houston, Tex., sales office to 2415 San Jacinto St., Houston 2, Tex. P. G. GREENE will manage this office as a branch of the company's Dallas district sales office.

Wisconsin

P. F. BAUER has been named manager of a newly formed central region of the General Machinery Division of the Allis-Chalmers Co., Milwaukee, Wis., and WILLIAM ARTHUR, formerly Philadelphia district office manager, has been placed in charge of a newly formed mid-Atlantic region of the company. Mr. Bauer's headquarters will be in Cleveland and Mr. Arthur's in Philadelphia.

ALFRED J. BOWEN has resigned his affiliation with the Gardner Machine Co., Beloit, Wis., in order to devote himself to the manufacture and sale of the Bowen grinder, a new type face-grinder for tool-room and production manufacturing. Mr. Bowen was with the Gardner Machine Co. for twenty-four years.

Obituaries

Roy V. Wright

Roy V. Wright

Roy V. Wright, since 1912 managing editor of the *Railway Age* and editor of the *Railway Mechanical Engineer*, died in his seventy-second year at the East Orange, N. J., General Hospital on July 9, following a heart attack. Mr. Wright was widely known and highly esteemed in publishing, engineering, and other circles.

Roy Wright was born in Red Wing, Minn., on October 8, 1876, and was educated in the public schools of St. Paul. He was graduated in mechanical engineering from the University of Minnesota in 1898. Following his graduation, he served as a machinist apprentice on the Chicago, Milwaukee, St. Paul & Pacific Railroad at St. Paul, and as draftsman and chief draftsman of the Chicago Great Western Railway. In 1901, he moved to Pittsburgh, Pa., to become mechanical engineer for the Pittsburgh & Lake Erie Railroad.

He had been a resident of East Orange, N. J., since 1904, when he joined the editorial staff in New York of the *American Engineer* and *Railroad Journal*, a predecessor of the *Railway Mechanical Engineer*, and had been continuously connected with that publicaiton and its affiliates ever since. He had been director of the Simmons-Boardman Publishing Corporation, the publisher of these papers since 1915, as well as vice-president and secretary of the company.

Mr. Wright's activities embraced a wide field, including besides engineering and publishing, civic, educational, and political affairs. Among the positions he held were president of the United Engineering Society (1928-1929) and of the John Fritz Medal Board (1935); president of the American Society of Mechanical Engineers (1931); president of the National Conference of Business Paper Editors (1939-1940) and of the Associated Business Papers (1940-1941); director of the Ampere Bank & Trust Co. of East Orange; New Jersey State Senator (1942-1947); delegate to the First International Management Conference at Prague, Czechoslovakia; director of the Y.M.C.A. at the Oranges; and president of the Silver Bay Association.

Following his presidency of the A.S.M.E. he was elected a Fellow of the Society and served it recently on its Engineers Civic Responsibility Committee. In this connection, he lectured for a number of years at the Newark College of Engineering on civic affairs and prepared a text-book for the course entitled "The Engineer's Duty as a Citizen." His other literary activities included a contribution to the work "Toward Civilization," edited by Charles A. Beard, and the co-authorship, with his wife, of a book entitled "How To be a Responsible Citizen." He was awarded the honorary degree of Doctor of Engineering by Stevens Institute of Technology in 1931, and was a member of the honorary societies Sigma Xi and Pi Tau Sigma.

Mr. Wright is survived by his widow and three daughters.

D. C. OVIATT, who had been active for the last thirty-five years in the machine and steel business, died suddenly on June 20. Mr. Oviatt had been owner and president since 1921 of the D. C. Oviatt Co., a company engaged in general machine work and in the manufacture of electrical controls for presses. Previous to 1920 he was connected with E. W. Bliss Co.

THEODORE JACOBSON, former factory manager and consulting engineer for S K F Industries, Inc., died on July 15 at his home in Philadelphia after a prolonged illness, at the age of sixty-four years. Mr. Jacobson was born in Malmo, Sweden, and had been associated with the S K F organization since 1913.

ONLY PHILLIPS RECESSED HEAD SCREWS

HAVE THESE JOB-PROVED MECHANICAL ADVANTAGES

RECESS EDGE IS ROUNDED AT TOP

Prevents pushing up burrs because contact with driver begins just below top surface of screw head. Easy for driver to "ride in" to a firm seat, without excess strain on driver.

WIDER OPENING AT RECESS CENTER

Absence of sharp corners provides wider center opening. This recess shape aids self-centering of driver. It also permits driving tool contour that insures maximum strength.

RECESS WALLS HAVE MINIMUM TAPER

Steep walls resist tendency of driver to ride or "cam" out of recess. Consequently, less end thrust is needed at any torque. Driver seats fast—stays seated.

THAT HELP ANY WORKER SPEED DRIVING—AVOID WASTE

SPEED ARTIST

Makes every second count. Won't take time to fuss with finicky recess designs. Wants Phillips' fast, easy "ride-in" to a firm seat without burring—to gain time for more production.

MUSCLE MAN

A little "heavy-handed". Hates driver "skids" because he knows their cost in delays and damage. Wants Phillips' automatic self-centering—knows it prevents "skids". Likes rugged Phillips' driver tips.

GREEN HAND

Wants to learn fast to work fast. Needs assurance of easier fit of driver in Phillips Recess. Can expend effort in *turning* screw, not in holding driver in recess. Avoids "skids" that gouge work or hands.

ANY TYPE OF WORKER on *any* assembly will find the Phillips Recess mechanically right for fast, trouble-free screw-driving, and for driving tool economy.
Top skilled workers might gain some advantage with any type of cross recess. But many are not top skilled.

The Phillips Recess is designed so no concessions in driving skill are needed. It is engineered for *practical production driving*, and it's job-proved design is one of the five essentials of a *standard* cross recessed head screw. Make sure you get all five . . . specify Phillips.

GET ALL THE ADVANTAGES OF ASSEMBLY WITH CROSS RECESSED HEAD SCREWS . . .

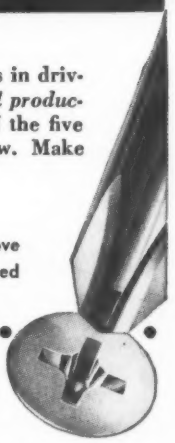
GET PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

27 SOURCES

American Screw Co.
Camcar Products Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Rockford Screw Products Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wales-Beech Corp.
Wolverine Bolt Company

GET THIS NEW BOOKLET of facts that prove the top value, top economy of Phillips Recessed Head Screws. It's free . . . use the coupon.



Phillips Screw Mfrs.,
c/o Horton-Noyes Co.
1800 Industrial Trust Bldg.
Providence, R. I.

Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

Name _____

Company _____

Address _____

M-32

New Books and Publications

INDUSTRIAL ELECTRONICS REFERENCE BOOK. 680 pages, 9 by 12 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $7.50.

Prepared by electronics and research engineers of the Westinghouse Electric Corporation, this handbook is a comprehensive and authoritative source of information on the basic theory of electrons and the design, application, and maintenance of electronic equipment in industry. It includes within one cover all the technical data needed to understand the scope and limitations of electronic equipment. The book contains thirty-six chapters, covering the following phases of the subject: Basic laws governing the production and control of electrons; kinetic theory of gases; atomic structure; electrons theory of solids; design, operation, and construction features of different types of electronic tubes; electronic circuit components, including resistance, capacitance, oscillator, and control circuits; design and application factors relating to transmission lines and antennas; different types of industrial equipment, including power-line carrier equipment, power rectifiers and inverters, radio-frequency heating equipment, and electronic instruments; and the factors involved in the care and maintenance of electronic tubes and apparatus. The information presented should enable the engineer to design successful electronic equipment and to develop new applications to suit his particular needs.

TECHNICAL DESCRIPTIVE GEOMETRY. By B. Leighton Wellman. 508 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, $4.

The purpose of this book is to provide students and industrial draftsmen with a complete up-to-date treatment of the subject of descriptive geometry. The book is written in simple language, and covers the subject thoroughly, beginning with the most elementary concepts and progressing by easy stages to the complex intersection and development problems found in modern applications. Practical applications are emphasized, especially with respect to surfaces—their representation, intersections, and development. Double-curved surfaces—so important in ship, automobile, and aircraft construction—are given special attention.

QUALITY CONTROL METHODS. By Clifford W. Kennedy. 243 pages, 6 by 9 inches. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price, $4.75.

The discussion of quality control methods here presented is the result of the author's own experience in learning the technique generally known as "statistical mthods in quality control." The book is intended to supply the elementary information required to gain a complete understanding of the subject, as well as details of the technical practices involved. The contents include acceptance sampling; batch control; distributions and the standard deviation; average and range; and guide to the administration of methods.

RATE OF PROPAGATION OF FATIGUE CRACKS IN 12-INCH BY 3/4-INCH STEEL PLATES WITH SEVERE GEOMETRICAL STRESS-RAISERS. By Wilbur M. Wilson and James L. Burke. 16 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Bulletin No. 371 of the Engineering Experiment Station. Price, 35 cents.

WHO, ME? . . . POINTERS IN JOB MANAGEMENT. By Arthur O. England. 24 pages, 4 1/2 by 6 3/4 inches (paper-bound). Published by The National Foremen's Institute, Inc., Deep River, Conn. Price, 25 cents.

Coming Events

AUGUST 10-13—First WESTERN PACKAGING EXPOSITION AND CONFERENCE ON PACKAGING, PACKING, AND SHIPPING at the Civic Auditorium, San Francisco, Calif. Sponsored and managed by Clapp & Poliak, Inc. Empire State Bldg., New York 1, N. Y.

AUGUST 26-SEPTEMBER 11—INTERNATIONAL MACHINE TOOL AND ENGINEERING EXPOSITION at Olympia, London, England. Sponsored by the Machine Tool Trades Association, Victoria House, Southampton Row, London W.C., England.

SEPTEMBER 13-17 — THIRD INSTRUMENT CONFERENCE AND EXHIBIT under the sponsorship of the Instrument Society of America, Pittsburgh 12, Pa., in Convention Hall, Philadelphia, Pa.

SEPTEMBER 27 - OCTOBER 1 — THIRD NATIONAL PLASTICS EXPOSITION in Grand Central Palace, New York. Sponsored by the Society of the Plastics Industry, Inc. Chairman, Nelson E. Gage, 295 Madison Ave., New York City.

OCTOBER 5-7—First regional MATERIALS-HANDLING EXPOSITION at the Mechanics Bldg. in Boston, Mass.

OCTOBER 11-13 — Sixteenth annual convention of the NATIONAL LUBRICATING GREASE INSTITUTE at the Edgewater Beach Hotel, Chicago, Ill. Executive Secretary, Carl E. Bolte, 4638 Mill Creek Parkway, Kansas City 2, Mo.

OCTOBER 20-22 — Thirtieth annual meeting of the AMERICAN STANDARDS ASSOCIATION at the Waldorf-Astoria Hotel in New York. Secretary, G. F. Hussey, Jr., 70 E. 45th St., New York 17, N. Y.

OCTOBER 23-29—Annual convention of the AMERICAN SOCIETY FOR METALS at the Benjamin Franklin Hotel, Philadelphia, Pa. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 25-28—Annual meeting of the INSTITUTE OF METALS DIVISION, AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS at the Hotel Adelphia, Philadelphia, Pa. Division Secretary, Ernest Kirkendall, 29 W. 39th St., New York 18, N. Y.

OCTOBER 25-29 — Annual convention of the AMERICAN WELDING SOCIETY at the Bellevue-Stratford Hotel, Philadelphia, Pa. Secretary, M. M. Kelly, 33 W. 39th St., New York 18, N. Y.

OCTOBER 25-29 — Thirtieth annual National Metal Congress and Exposition sponsored by the AMERICAN SOCIETY FOR METALS; headquarters, Commercial Museum and Convention Halls, Philadelphia, Pa. National Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

NOVEMBER 4-6 — Annual Technical Forum of the NATIONAL ELECTRONICS CONFERENCE, INC., at the Edgewater Beach Hotel, Chicago, Ill., under the joint sponsorship of the Illinois Institute of Technology, Northwestern University, American Institute of Electrical Engineers, Institute of Radio Engineers, and the University of Illinois. Further information can be obtained from J. A. M. Lyon, Northwestern Technological Institute, Evanston, Ill.

NOVEMBER 28-DECEMBER 3 — Annual convention of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. Secretary, Clarence E. Davies, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 29-DECEMBER 4 — EIGHTEENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING at the Grand Central Palace in New York. Chairman of the advisory committee, New York 17, N. Y.

As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire.

SPEEDAIRE made it possible

THE layout of this paper box plant allows little clearance for the Wood Screen drive. As this photo shows, motor and speed reducer are mounted on a short, narrow ledge. There is not enough room for a standard drive. Only a compact, powerful Speedaire would go in the limited space available.

Speedaire not only saved space; it saved weight and saved money. A standard worm-gear unit to handle the load would have cost 19% more, weighed 30% more and required 61.4% more space.

Speedaire is Cleveland's new fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantage of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3276 East 80th St., Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers

CMC
CLEARING
MECHANICAL & HYDRAULIC

Above: CLEARING 3000 TON CRANKLESS PRESSES making rails for automobile chassis.

Right: CLEARING 75 TON GAP FRAME PRESSES in a large appliance plant.

LARGE OR SMALL— THEY SPELL ECONOMY

Thirty-foot rails for bus frames or parts for a household appliance — Clearing presses turn them out swiftly and completely, ready for assembly with no labor costs for grinding, drilling or other subsequent operations. Because Clearing presses deliver accurately formed work, assembly is smooth and rapid. No wonder that production costs are driven down.

Equally important, Clearing affords unique features of design and construction which yield longer die life, with fewer interruptions to production for die repair or regrind. Every production man knows what these items mean on a cost sheet.

Whether you need 60 tons capacity or 3,000 tons or more, Clearing can furnish a press that will produce for you with maximum economy when all factors are taken into account. That's a plain, straightforward statement. We'd like to have you make us prove it.

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